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INDEX TO CONTENTS, PAGE 215. - - - - - - - - ADVERTISERS' INDEX, PAGE 22.

Riter-Conley Manufacturing Company

STEEL CONSTRUCTION

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THE UNITED GAS IMPROVEMENT COMPANY,

PHILADELPHIA.

BUILDERS OF

THE STANDARD DOUBLE SUPERHEATER

LOWE WATER GAS APPARATUS.

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OF

AIR AND STEAM SUPPLY

(PATENTED),

AFFORDING { PERFECT CONTROL OF GENERATOR FIRE CONDITIONS.

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CONTENTS.

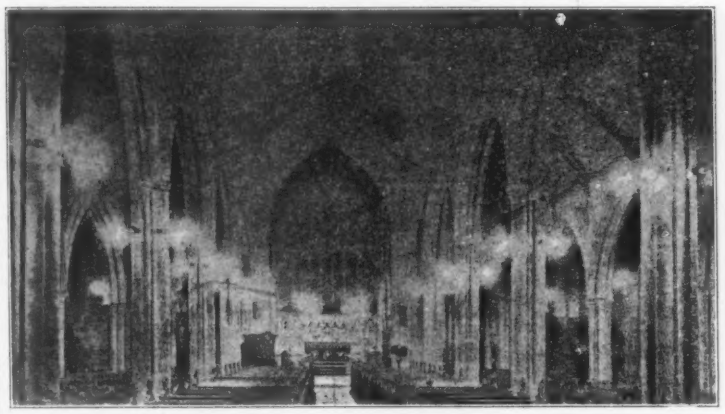
An Asterisk (*) Denotes an Illustrated Article.

*Church Lighting by Incandescent Gas Lamps 215
*An Obscure Street Lifted into Prominence by Gas Arcs, by Mr. A. H. Scott. 215
Proceedings, Forty-second Meeting, New England Association of Gas Engineers—Continued from Page 203. 216
First Day, Morning Session—*Recent Developments in the Manufacture of Water Gas, by Mr. V. E. Bird—Discussion.
Proceedings, Sixth Annual Meeting, American Gas Institute—Continued from Page 211..... 220
Second Day, Section B.—*Tar and Tar Products, by Mr. A. D. Whittaker—Discussion—Second Day, Afternoon Session—The Bone Lecture on Surface Combustion—Vote of Thanks—Adjourned.
OFFICIAL NOTICES—
Fourth Meeting of the Pennsylvania Gas Association..... 222
Fourth Meeting, Southern Gas Association..... 222
NOTICE—
Celebration of the Centenary of the Introduction of Gas as an Illuminant, Under the Auspices of the Am. Philos. Soc.; the Franklin Institute; the American Chemical Soc.; the American Gas Institute 222
EDITORIALS—
Briefly Told..... 222
The Centenary of the Gas Lighting Industry—The Williamsport Meeting, Pennsylvania Gas Association—Illumination Standards—Current Mention.
Book Reviews..... 223
Publications..... 223
SPECIAL ENGLISH CORRESPONDENCE..... 228
The Coal Supply—Oxide Purification—Horizontal *vs.* Vertical Retorts—Slot Meter Robberies in London.
MANAGEMENT AND COMMERCIAL METHODS..... 230
*Ground-Thawing Method.
Recent Patent Issues..... 230
ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 230
The Clark Company's No. C. Jewel, 576—The Proposed Plant for Waxahachie, Tex.—Mr. Henry I. Lea will Supervise the Reconstruction—How Mr. Lawson Managed "Jack" Frost in Rutland, Vt.—A Bill to Regulate Gas Appliance Sales, etc., Washington, D. C.—Death of Mr. Geo. G. Atkinson—Gain in Output, Amarillo, Tex.—First Dividend, Pacific Coast Gas and Electric Co.—Contracts for The Gas Machinery Company—Three Personals—Mr. V. F. Dewey to Take Charge of the Utah Gas and Coke Co.—Something from Watertown, Conn.—Capital Increase, Middletown, Conn.—Death of Mr. Joseph J. Buckley—March Meeting, Employees, Pawtucket (R. I.) Company—And Many Other Items.
The Market for Gas Securities..... 232
Meeting Times of the Various Gas Associations..... 232
Public Lighting Table for April, 1912 (Advertising Section)..... 27

Church Lighting by Incandescent Gas Lamps.

The *Gas World* in its issue for March 16 last, in referring to the illustration herewith declares that great progress continues to be made in the substitution of incandescent gas lamps for flat flame burners in the illuminating of church interiors. One of the latest of these installations is reported from Cardiff, where the Gas Company seems to have effectively lighted St. John's Church, the lighting being accomplished through the medium of 87 burners of the Hands' type of inverted "Cove" burner. The change met with the approval of the parishioners.

[See illustration on following column.]



An Obscure Street Lifted Into Prominence by Gas Arcs.

[Prepared by Mr. A. H. SCOTT, Engineer, Manchester, N. H., for *New Business*, Phila.]

About the middle of the summer of 1911 the Peoples Gas Light Company installed, in front of its office and salesroom, 5 outdoor gas arcs. The illumination given by these lamps threw the rest of Hanover street, between Elm and Chestnut streets, into comparative darkness, although that locality was as well lighted as the average business street in this city. The bright spot in front of the Gas Company's office immediately excited public comment and the interest of the merchants along the street was aroused.

Inquiry followed as to the best method and probable cost of securing similar illumination for the whole square, and after considerable discussion the following scheme was decided upon as promising the most satisfactory results.

The Peoples Gas Light Company agreed to furnish, maintain in goon conditiod for 3 years, and to light and extinguish, each night, 32 inverted gas arcs on ornamental posts. The payment for this service, according to the plan, would be divided among the various merchants and manufacturers in proportion to their frontage on the street, and a contract would be made between the Gas Company and each individual. The Company was also required to furnish a bond to the city of Manchester to indemnify the city in the event of any accident which might occur. This plan was accepted and the contracts secured.

The preliminary arrangements occupied some time, and the winter season was well advanced before the ornamental posts that had been selected could be definitely ordered. Having decided that this installation was wanted, those most interested in it naturally desired to have it in operation at the earliest possible moment, and particularly before the holiday season. The manufacturers made every effort and commenced delivery of the posts late Monday afternoon, the week before Christmas. The posts were hauled direct to their locations on the street and a force of men immediately started to work setting them up. By working night and day, all the posts were set up, lamps connected and sidewalks repaired in 2 days. The lamps were lighted Wednesday night, December 20, for the first time.

The installation has proved a complete success. From a comparatively insignificant street—obscure because of poor lighting—Hanover street has been transformed into the most prominent street in the

This Street in Manchester, N. H., has been Lifted into Prominence by Gas Arcs.

city and one of the best lighted streets in New England. The contributors to the scheme are all delighted with the resutls, and, from a financial viewpoint, the lights seem to be justifying themselves to those who are paying for them. This last point is most gratifying to the Gas Company, as already numerous inquiries have been made by merchants in other parts of the city as to the feasibility of making similar installations, and it is probable that more than one of these inquiries will result in actual business of this nature.

[Official Report Furnished by the Secretary - Continued from Page 203.]

FORTY-SECOND MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held in Young's Hotel, Boston, Mass., Feb. 14 and 15, 1912.

First Day—Morning Session.

The President called on Mr. Viggo E. Bird, of Fall River, Mass., to read his paper on

RECENT DEVELOPMENTS IN THE MANUFACTURE OF WATER GAS,

which that gentleman did as follows:

Mr. President and Gentlemen: The paper which I am about to read deals with the methods of operation and the results obtained at the water gas plant of the Fall River (Mass.) Gas Works Company. Since the early part of October, 1911, we have been operating with a new system of steam control, a New England creation. This system consists, briefly, in introducing the steam through the side of the generator, as well as under the grate bars on an up-run, and through the side jets during the blow, the steam admission being controlled (as in the old method of operation) by a single valve in the main base steam line, operated from the generator floor. Before describing the system proper it might be well to state the equipment with which we operate at Fall River. This consists of four 8 feet 6 inches Lowe water gas sets, of which two are in operation at a time. Fig. 1 shows one of these generators equipped with Barnum's system. It consists of 16 steam nozzles inserted through the generator lining. These nozzles are arranged in 3 levels, 14 inches, 20 inches and 26 inches above the grate bars, respectively. The lower level has 4 nozzles, the intermediate level 8, and the top level 4 nozzles, that arrangement having proved most satisfactory. Each nozzle is controlled by a ¾-inch valve, *A*.

The nozzles, so-called, are nothing but pieces of ¾-inch pipe inserted through the shell and through the first course of lining brick. The inside course of brick is cut away in front of the pipe opening, so as to give a flare to the emitting steam. The main steam line, encircling the generator and supplying the ¾-inch nozzles, is a 1½-inch line controlled by the valve *B*. This, again, is fed from the main base steam line, which is a 2½-inch line. *A* is a steam meter registering (in pounds per minute) the total amount of steam used on the

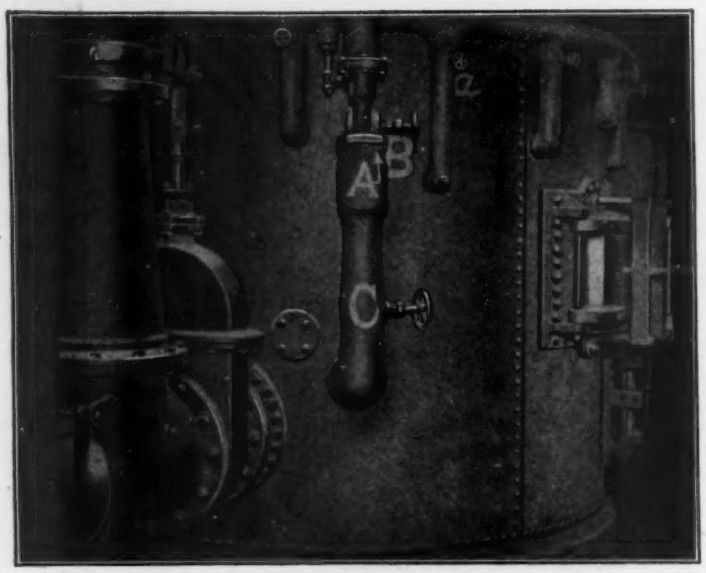


Fig. 1.—Steam Controller.

up-run, and *C* is a 2½-inch valve controlling the amount of steam introduced under the grate bars. In this way it is seen great flexibility for the introduction of steam is secured without complicating the operation of putting on a run.

The relative proper openings of the valve *B* and *C* can be readily determined experimentally; also, the individual nozzle valves can be adjusted periodically to conform with the condition of the fires. The questions now arise, what results may be obta ined by this method of operation; and what is the theory of any benefit that may be derived therefrom?

To answer the first question, I will submitt our operating results for November, 1911, with a rough thermic consideration thereof. They were:

Generator coal, per 1,000	26.55
Oil, per 1,000	3.80
Candle power	22.83
Candles, per gallon	6.01

The generator coal and oil are figured from the gas made corrected to 60° F. and 30 inches barometric pressure.

Let us next investigate the disposal of the heat contained in the 26.55 pounds of coal absorbed in the generator per 1,000 feet of gas made. In doing this we have nine considerations to make:

(1) The heat carried up the stack.
(2) Heat lost in decomposing the steam.
(3) Heat energy of the CO produced.
(4) Heat carried off by the illuminating gases.
(5) Heat lost by radiation and convection.
(6) Heat rendered latent by gasification of oil.

(7) Heat lost in the tar.
(8) Heat lost due to moisture in the coal.
(9) Sensible heat of the ash.

Analysis of the coal used, which is a hard, white ash, gave the following results:

Content.	Per Cent.
Moisture	2.75
Volatile	4.40
Fixed carbon	81.46
Ash.	11.39

Therefore, of the 26.55 pounds of coal used per 1,000 in the generator, 11.39 per cent., or 3.02 pounds, is ash. The amount of coal in the ash generator refuse was found to be 14.3 per cent. From this we get that 3.02 pounds represents 85.7 per cent. of the total ash and coal recovered, giving a total per 1,000 of 3.52 pounds. In other words, 14.3 per cent. of 3.52, or .5 pound of coal per 1,000, is lost, which, subtracted from 26.55, leaves a net consumption of 26 pounds of coal per 1,000. The B.T.U.'s per pound of coal were found to be 13,158 (wet basis), which gives us a total of 342,108 B.T.U.'s to account for per 1,000. It might be of interest in this connection to note that a sample of the generator refuse taken from above the grate bars was analyzed with the following results:

Content.	Per Cent.
Volatile matter	1.25
Fixed carbon	18.08
Ash	80.67

Similarly, a sample was taken from the generator refuse which dropped through the grate bars during the operation of the set, with the following result:

Content.	Per Cent.
Volatile matter	0.39
Fixed carbon	1.52
Ash	98.09

Showing the greater part of our loss here is within our reach.

(1.)—The Heat Loss in the Stack.

Taking the temperature of the air entering the generator at 60° F., and the temperature of the blast products leaving the superheater as 1,208° F., we have a rise in temperature of 1,148° F. Analysis of the blast products gave:

CO_2	18.8	per cent.
O	0.5	"
CO		"
N	80.7	"

Now, 0.5 per cent. free oxygen represents 2.6 per cent. excess of air. It takes 143.5 cubic feet of air to burn 1 pound of carbon; therefore, the amount of air used per pound of carbon in this case was 147.2 cubic feet. We have, therefore, for the composition of each 147.2 cubic feet of air:

CO_2	= 18.8 per cent.	=	27.67 cubic feet.
O	= 0.5 "	=	0.74 "
N	= 80.7 "	=	118.79 "

The heat necessary to raise these gases from 60° to 1,208° is the specific heat multiplied by the quantity of gas and multiplied by the rise in temperature; or,

CO_2	= 27.67	× .0247 × 1,148	=	785
O	= 0.74	× .0182 × 1,148	=	15
N	= 118.79	× .0181 × 1,148	=	2,460
				3,260 B.T.U.

The analysis of the coal gave 81.46 per cent. C; therefore, the heat carried up by the stack per 1,000 is:

26.05 by .8146 by 3,260 = 69.178 B.T.U. per 1,000.

(2.)—Heat Lost in Decomposing Steam.

By comparative analysis of carbureted and uncarbureted water gas we find 66.7 per cent. of the finished gas to be pure water gas, with the following distribution:

CO	30.6	per cent.
H	33.4	"
CO_2	1.9	"
N	0.8	"

In other words, 334 cubic feet of H_2 are liberated in the generator per 1,000 of carbureted water gas made. Now, 1 pound of H_2, at 60° F., contains 189.2 cubic feet, hence we have the weight of the H_2 liberated, and $\frac{334}{189.2} = 1.7653$ pounds H_2.

The complete combustion of hydrogen to water at 32° F. develops 61,816 B.T.U. As the steam, however, enters the generators at a temperature of 327° F., we must, therefore, subtract from the above the total heat required to raise the product of combustion of 1 pound of H from 32° to 327° F.; or,

1,182 by 8.98 = 10,614 B.T.U.

Consequently the heat absorbed in the generator per pound of H. liberated is

61,816 — 10,614 = 51,202 B.T.U.

or a total per 1,000 of

51,202 by 1.7653 = 90,387 B.T.U.'s per 1,000.

(3.)—Heat Energy of CO Produced.

The analysis of the finished gas gave 30.6 per cent. CO. Now: 1 pound of CO, at 60° F., contains 13,531 cubic feet, therefore, the CO per 1,000 weighs: $\frac{306}{13,531} = 22.6$ pounds.

Hence the energy of the CO produced is

22.6 by 4,395.6 = 99,340 B.T.U. per 1,000.

(4.)—Heat Carried Off by Illuminating Gases.

The temperature of the illuminating gas leaving the superheater was 1,180° F., and that of the entering oil 50° F., giving a rise in temperature of 1,130° F. The heat loss, therefore, will be the quantity of gas multiplied by the specific heat, multiplied by the rise in temperature, or

47.79 by .46 by 1,130 = 24,841 B.T.U.'s per 1,000.

(5.)—Heat Lost by Radiation and Convection,

Due to the lack of time and facilities for determining these figures experimentally, I shall have to assume the values determined by Mr. Glasgow, as given in his paper read before the American Gas Light Association in 1890. We, therefore, have 3.7 per cent. for the radiation losses, or

3.7 by 342,108 = 12,660 B.T.U.'s per 1,000;

and for the losses due to convection 4.6 per cent., or

4.6 by 342,108 = 15,740 B.T.U.'s per 1,000.

(6.)—Heat Rendered Latent by Gasification of the Oil.

We have seen that the amount of oil used per 1,000 was 3.80 gallons. The specific gravity of this oil was .85; that is, the weight of oil used was

8.32 by .85 by 3.80 = 26.87 pounds per 1,000.

We recovered, however, .37 gallon of tar per 1,000, with a specific gravity of 1.03; or

37 by 8.32 by 1.03 = 3.17 pounds per 1,000.

Therefore, assuming the heat of vaporization of the oil to be 500 B.T.U. per pound, we have

23.7 by 500 = 11,850 B.T.U.'s per 1,000.

This figure (500 B.T.U.'s as the heat of vaporization of oil) is somewhat arbitrarily chosen and is, therefore, open to serious question. If we view this matter of the gasification of oil from an academic point of view; that is, if we consider the heat of formation, plus or minus, we find it to be plus, as follows:

Composition.	Per Cent.	Feet per 1,000		By Heat of Formation.		
C_2H_4	15.1	151.00	×	12.9	=	1,948
CH_4	16.3	163.00	×	103.1	=	16,805
Tar	0.37 gals.	3.17 lbs.	×	545.0	=	1,728

That is, 16,805 B.T.U.'s are liberated in the gasification of the oil, while 3,676 B.T.U.'s are absorbed; or, in other words, we find a balance of heat liberated over heat absorbed equal to 13,129 B.T.U.'s.

On the other hand, if we consider this question from a practical point of view, we all know that our carbureter heats drop considerably during each run, and heat is required in the form of CO, gas being burned in the carbureter on each blow in order to bring the heats back to whatever our operating temperatures may be. In other words, the practical consideration shows an expenditure of heat in the gasification of the oil. Mr. Glasgow has dealt with this matter from the practical point of view, in the paper to which I have already referred, and my assumption of 500 B.T.U.'s per pound as the heat of vaporization of oil is based principally upon his calculations.

I should like very much to be enlightened on this subject, and I sincerely hope a good many of the members present may have some data on this subject. I think it is a very interesting question, well worth a thorough discussion.

(7.)—Heat Lost in the Air.

The heat lost by the tar is equal to the weight of tar recovered multiplied by its specific heat and multiplied by the rise in temperature. The tar recovered was 3.17 pounds per 1,000, and, assuming 760 for the value of the specific heat for raising 1 pound of tar from 50° to 1,180°, we have for this item:

760 by 3.17 = 2,409 B.T.U.'s per 1,000.

(8.)—Heat Lost Due to Moisture in the Coal.

The analysis of the coal gave 2.75 per cent. moisture. We, therefore, have a heat loss of

(26.55 by 2.73) by 1,588 = 1,160 B.T.U.'s per 1.000;

1,588 B.T.U.'s being the heat required to raise 1 pound of water from 60° to 1,200° F.

(9.)—The Sensible Heat of the Ash.

This is the amount of ash and unconsumed coal per 1,000 multiplied by the rise in temperature multiplied by the specific heat, or

3.52 by 1,158 by .25 = 1,019 B.T.U.'s per 1,000.

I want to add here that the question has been asked of me within the last few days, whether we introduce our oil into the generator. I would like to say that we do, and did do, so during the month of November, for which these results were taken. Whether there is actually a gain by doing this depends, I think, upon the point of view taken.

As far as oil efficiency is concerned my opinion is that there is no appreciable gain, if any at all; moreover, there may be a very considerable loss due to naphthaline trouble, lampblack, etc., if care is not taken in keeping the closest watch on the progress of the generator heats. On the other hand, as far as coal efficiency is concerned, I think there is a substantial gain by the introduction of the oil in the generator. In my judgment it, therefore, becomes a question of weighing the two alternatives against each other, and take the oil out of the generator when the net gain is zero, and that is what we aim to do.

After cleaning our fires in the morning we generally charge 6,000 pounds of coal, which means a heavy, inactive fuel bed in your generator, as far as gas making is concerned, yet, it very rapidly becomes hot enough to vaporize oil, and it is then we start running oil in the generator on the up-runs. In doing this I feel we save time and coal in blowing for our carburetor heats, moreover, you tend to keep your reaction zone in the generator low, at the same time increasing the depth of the active zone slowly but uniformly. However, as the heat of the fuel bed rises to the surface you approach the neutral condition; that is, the point when the gain in generator efficiency is offset by the loss in oil efficiency. For the period of operation considered in this paper, I find that the amount of oil introduced into the generator was approximately 12 per cent. of the total oil used. Granting, then, that the tar from this portion of the oil is entirely consumed in the generator, for gas making purposes, which is hardly probable, this would be equivalent to about ¾ pound of generating fuel per 1,000. However this may be, we introduced oil in the generator in the old system of operation as well as now, with the one difference perhaps that we used a greater per cent., so I feel the figures which I have given above would show conservatively the increased efficiency of the present system of operation.

Summary of Heat Disposal.

Summing up these 9 items we, therefore, have:

Heat Disposition.	B.T.U.'s. per 1,000.	Per Cent.
1. Heat carried up the stack	69,178	20.23
2. Heat of decomposition of steam	90,387	26.42
3. Heat energy of CO produced	99,340	29.04
4. Heat carried off by illuminating gases	24,841	7.26
5. Heat lost by radiation and convection.	28,400	8.30
6. Heat due to gasification of oil	11,850	3.47
7. Heat lost in the tar	2,440	0.71
8. Heat lost due to moisture in coal	1,160	0.33
9. Sensible heat of the ash	1,019	0.30
	328,615	96.06
Unaccounted-for	13,493	3.94
	342,108	100.00

Taking, therefore, the gross amount of coal charged per 1,000 under the present system—26.55 as against 28.5 pounds per 1,000 for the old method of operation (that 28.5 was about our past average for a year), we have an increase in the gross efficiency of the set, as a heat machine, equal to 7 per cent.

Discussion of the Results.

The question now remains, what is the theory of this gain? To answer this question let us briefly analyze the reactions taking place in a generator. They are:

(1) $H_2O + C = H_2 + CO$.
(2) $2H_2O + C = 2H_2 + CO_2$.
(3) $H_2O + CO = H_2 + CO_2$.
(4) $CO_2 + C = 2CO$.

The reason why reaction (3) can take place only in the direction in which H_2 and CO_2 are formed may be found by a study of the equilibrium constant of this expression; that is, the ratio

$$\frac{H_2O \times CO}{H_2 \times CO_2}$$

but for this I will refer you to "Bulletin No. 7," Bureau of Mines; p. 51.

As for reaction (4) since the per cent. of CO_2 present at temperatures above 1,832° F. is in excess of the amount which would be in equilibrium with carbon and CO, reaction (4) can take place only in the direction in which CO is formed. An examination of the curves for the production of CO_2 and CO, given in the "Bulletin" to which I have referred, would indicate that the CO_2 formed by reactions (2) and (3) are later broken up by reaction (4).

(1) and (2) are fundamental reactions, (3) and (4) readjustments.

Reactions (3) and (4), according to the laws of chemical mass, reaction taking place only in the direction from left to right. Now, therefore, we are chiefly concerned with the conditions governing the formation of hydrogen and carbon monoxide. As for the liberation of hydrogen from the decomposition of steam in the presence of incandescent carbon, it has been shown that, at a temperature of 2,012° F., with infinite time of contact the steam will be completely decomposed. On the other hand, with a velocity of .5 foot per second, and a temperature of 2,372° F., the decomposition is completed in 2 seconds. The amount of CO formed in the generator from reaction (1) necessarily also depends upon 3 things; namely, the temperature of the fire, the depth of the hot portion of the fuel bed and the rate of flow of the gas through the zone of reaction. For a long and very thorough discussion of reaction (4), I will refer you to "Bulletin No. 7" of the Bureau of Mines. Suffice it, therefore, to say, that it has been demonstrated that the higher the temperature of the fuel bed, the greater the rapidity with which equilibrium in this reaction is established, and the greater the per cent. of CO formed. Moreover, when equilibrium is established, the relation

$$\frac{(CO)^2}{CO_2} = K$$

must be satisfied, where, for any given temperature, "K" is a constant.

Thus, for instance, a mixture of CO and CO_2, in the presence of incandescent anthracite at a temperature of 2,012° F., gave 30.0 per cent. CO with a time of contact between gas and coal of 3.3 seconds; whereas, with approximately the same time of contact, at 2,372° F., 87 per cent. CO was formed. In the expression

$$\frac{(CO)^2}{CO_2} = K$$

(CO) and (CO_2) denote the concentrations of CO and CO_2 respectively gram-molecules per liter. A gram-molecule of any substance is its molecular weight in grams.

One gram-molecule of H_2O = 18 grams.
" " " " CO = 28 grams.

The expression above has not been proved, I believe; but thermodynamic considerations and reasoning, together with experiments, have led investigators to believe this expression to hold true.

Conclusion.—From what has been said above we can readily see that the most essential conditions for successful operation are high temperature with the proper depth of fuel bed. It appears essential (theoretically) that the zone of reaction should not be allowed to cool below 2,000° F.; on the other hand, a temperature above 2,300° F. seems most advantageous for anthracite coal. I specify here anthracite coal, because these temperature-limits would differ with different kinds of fuel. For instance, with coke you could no doubt carry this minimum temperature somewhat lower; moreover, the limiting conditions would also be greatly influenced by the rate of make which you wish to obtain. I can, however, say that with our operating conditions the theoretical limits which I have stated above are approached very closely in the reaction-zone of our generators. We all know, however, that high temperatures in the generator are coincident with heavy clinker formations, and consequent loss of time in cleaning and barring down. This, however, is where the side nozzles do their most effective work. They do not prevent clinker formation, but they take care of it. It is possible to blow the generator, so as to get the active zone of the fuel bed at a white heat of 2,300° F. and over, and yet soften the clinker which necessarily forms enough so as to afford easy cleaning.

The salient feature of this system, therefore, lies in that the contact surface between steam and carbon is very largely increased, every portion of the active part of the fuel bed being reached by the steam. This makes it possible to get a more uniform temperature throughout the fire and gives, as a consequence, a more intense and more uniformly distributed reaction. It is interesting in this connection to note that, even though we have reduced the amount of steam introduced into the generator by only about 5 per cent., the steam consumption per 1,000 has been reduced over 20 per cent. (with a corresponding saving in boiler fuel) showing that a greater per cent. of the steam introduced is being gasified under the present method of operation. In conclusion, gentlemen, I wish to apoligize for the crudeness of this paper. All I can say is that time has been against me; but, perhaps at some future date, I may be able to do better justice to a so vital and interesting topic. Thank you.

Discussion.

The President—Gentlemen, you have listened to the reading of a most important paper. It has come to me that Dr. Beardsley has some data with some other very valuable information on the theoretical possibilities of this system, if he will be kind enough to give us the benefit thereof.

Dr. Beardsley—I notice that from the 26.05 pounds of coal which are used per 1,000, we can figure back a carbon consumption, deducting the ash and the moisture, of 22.37 pounds of carbon per 1,000. I made an independent calculation for a somewhat different gas; namely, 20-candle power gas, made with 3.4 gallons of oil per 1,000, to find out if possible what the theoretical consumption of carbon per 1,000 would be. The results appeared to be that 22.32 pounds of carbon passed the theoretical amount, taking into consideration the same losses as in this paper, and of that quantity 10.75 pounds were consumed in the run and 11.57 pounds during the blow, which checks quite closely with the figure of 22.37 that is deduced from the coal

consumption given above. There are certain items in this heat balance which are capable of yielding somewhat different results on calculation. Under this first item, the heat lost at the stack, at the bottom of page 4, the per cent. of coal which is burned is taken as being the fixed carbon only. The volatile combustible is also composed chiefly of carbon and should be included, not only for that reason, but because that portion of it which is hydrogen will form even more combustible products per pound than the carbon portion. The combustible in the coal would, I figure, then be 85.66, rather than 81.46 per cent. In figuring the heat lost at the stack the total fuel per 1,000 (26.05) is taken as the basis, at the bottom of page 4. Actually the heat loss occurs during the blow only, and should be figured, therefore, only on that portion of the fuel consumed in the blow. What portion of this 26.05 is consumed in the blow is not stated, but may be estimated approximately from the analysis of the blue water gas given at the top of page 5. I figure from this that 10.33 pounds of carbon becomes blue gas. This is quite close to the figure of 10.75 which I have calculated for another case. If the coal is assumed to be 85.86 per cent. carbon, would represent 12.03 pounds of generator fuel, leaving a difference of 14.02 pounds from the 26.05 pounds charged, as that consumed in the blow. On this basis the heat loss at the stack is 41,590 B.T.U., which is the figure to replace the 69,178 at the foot of page 4. In making those figures I used slightly different factors for the cubic feet of air necessary to burn 1 pound carbon, and also for the specific heats of the gases in question. There is in addition also a certain amount of steam present in the combustion products, partly from the combustion of the hydrogen in the coal and partly also from the steam which I notice is injected into the generator during the blow. One pound of steam entering the generator at 327° F. and leaving the stack at 1,208°, will abstract 435 B.T.U. from the machines. Probably there was as much as 2 pounds of steam per 1,000 used in this system during the blow, which should be added to the loss in the stack, making a total of 42,460 as against 69,178.

Heat Lost in Decomposing Steam.—The experiments of the Bureau of Mines have shown that there is regularly formed in the generator 1 to 2 per cent. of marsh gas during the run. If the hydrogen present in that marsh gas is taken into consideration, then more steam is decomposed and the heat loss from this source might have to be raised by perhaps 6 per cent.

Heat Carried Away in the Illuminating Gases.—There is always an excess of steam supplied to the generator over that which becomes blue gas. This excess escapes with the illuminating gas and will abstract, at a temperature of 1,130°, about 400 B.T.U. per pound of steam from the set. Probably 8 pounds of steam would not be a large excess, which gives a figure of 3,200 B.T.U. to add to the 24,841 given in the paper, making a total of 28,040.

The Item of Heat Lost by Radiation and Convection.—If I am not mistaken, Mr. Glasgow's figures were for a set of 6 feet diameter. As Mr. Bird's figures are for an 8-foot 6-inch set, the area exposed, per unit of capacity or per 1,000, is less, and the figure should be reduced in accordance with the area exposed, which would bring down the heat loss of 28,400 to approximately 15,875. Then there is the question of the heat rendered latent by gasification of the oil. It should be possible to arrive fairly close to this by the following equation: The total heat of combustion obtainable from the oil supplied must be equal to the total heat of combustion of the oil gas and tar made, plus or minus the heat liberated or absorbed in the reaction. That is merely the law of conservation of energy. In the present case it is somewhat difficult to apply this equation for this reason: According to the analysis of the oil gas the weight of the oil gas obtained figures out 18.2 pounds per 1,000. That is, 18.2 pounds represent that portion of the total gas which is oil gas. In addition, we have 3.17 pounds of tar, making a total of 21.37 pounds of products resulting from 26.87 pounds of oil. That leaves a discrepancy of 5.5 pounds to be accounted for. Of, course, you could not expect the sum of the gases found by analysis and the tar to exactly equal the oil. However, on the basis of a weight of oil equal to that of the products, we can figure the heats of combustion, and we find that the heat of combustion of this amount of oil, 21.37 pounds, will be 416,715, and that heat of combustion of the combined gas and tar produced is 467,440 B.T.U., leaving a gain of 50,725 B.T.U., which represents the heat rendered latent in the gasification of the oil or extracted from the carbureter and superheater. If you apply those figures in the same proportion for 26.87 pounds of oil, instead of 21.37 pounds, the amount rendered latent in the gasification of the oil becomes 63,780, which is a very much larger figure than that obtained in this paper, by calling the loss per pound of oil 500 B.T.U. If you include these various changes in these heat items, the balance, however, is not far different, because what is gained in one item is lost in another. I make the sum 344,500 B.T. U., as against 342,100 B,T.U. by fuel charged, showing a fairly close agreement between the two. In the last paragraph (the conclusion) it is stated that 5 per cent. less steam is used actually and 20 per cent. less per 1,000. As near as I calculate that should represent an increase in capacity of the set of 19 per cent. I should like to inquire if an increase in capacity of about that amount has been actually experienced?

Mr. Bird—Yes.

The President—Has Major Hinman anything to offer on this subject?

Major Hinman—I am somewhat hard of hearing, and perhaps Mr. Beardsley has quite largely anticipated what I have to say, so that I shall be rather brief in my remarks. I am not quite sure whether a complete analysis is given of the water gas produced; it seems to be given in 2 different places. On page 7 it is stated, I take it, for the oil. The oil gas part of the water gas is composed of 15.1 per cent. of ethylene and 16.3 per cent. of marsh gas. I have analyzed in my experience quite a number of oil gases, and never found the hydrocarbons to be composed exclusively of ethylene, and also I have always found either some hydrogen or ethane. It never comes out in my analysis that it is an even CH_4. There is always some hydrogen or ethane C_2H_6. And, then, on the blue water gas the analysis is given on page 5. That is stated to be just two-thirds the total water gas, which accords very closely with my experience, except that the nitrogen is extremely low. I have but seldom found nitrogen in water gas less than 2 per cent.; it runs from 2 to 2½. It is given here as .8 per cent. The disposal of the heat I think is an important point, but I don't think it is possible to figure it out anywhere nearly as accurately as is attempted to be done here. Quite a number of the estimates are carried out to 5 significant figures. I personally should be very glad to be sure that the first significant figure was right. The gas analyses were probably made with a Hempel or some similar apparatus. The gases (CO_2, O, CmHn and CO) determined by absorption were probably fairly correct. Hempel says, with careful work, the error is about ¼ per cent. With the other gases (H_2, CH_4 and N_2) the probable error is much larger. Hempel says about 1 per cent.; but Treadwell gives analyses of the same gas that do not agree within 3 or 4 per cent.; and my experience has been similar. In discussing the heat lost in the stack an analysis of the blast products is given which cannot be correct for the average waste gases. If the coal used were pure carbon, and completely burned, the ratio of nitrogen to carbonic acid would be $\frac{79.1}{20.9} = 3.79$. As given, after allowing for the air present, it is $\frac{78.8}{18.8} = 4.19$. In the products of complete combustion of Lehigh coal the ratio would be 4.09. The specific heats of the gases are given for the ordinary temperature. They are considerably higher at high temperatures. No account is made of the volatile matter of the coal. If we take Dr. Percy's analysis of Lehigh coal, and the higher specific heats of the gases, but keeping the given composition of the waste gases, we have a total of about 80,600 B.T.U.'s instead of the 61,178 B.T.U.'s given. That is, about 16 per cent. should be added to the heat lost in the stack, Different experimenters vary about 2 per cent. in their determinations of the heat of combustion of hydrogen and carbonic oxide. Besides this the errors of analysis may be from 1 to 4 per cent. Even after the correction of the first item there is liable to be an error of 5 per cent. in the first 3 items. Items 4 and 5 are liable to be largely in error, perhaps as much as 25 per cent. Item No. 6 is simply a guess, and the true value may be less than ½ that given, or it may be more than twice as large. Items 7, 8 and 9 are insignificant in amount. After correcting the first item the heat of combustion of the coal is accounted for to a fraction of 1 per cent., but there are liable to be large errors in the individual items that just balance.

Mr. Miller—While Mr. Bird was reading this paper I discovered what I think is an error, and Mr. Beardsley mentioned it. However, I will express it again in a different way. Under the heat lost in the stack he has assumed that all of the fuel is burned and goes up the stack, which, of course, is not true. A certain proportion of it goes into making CO in the water gas. If you assume that all the fuel is burned, he is using something like 3,800 cublic feet of air per 1,000 feet of gas, when ordinarily, as I remember, without recalculating it, you use about 2,500.

Mr. Ramsburg—I appreciate very much being a privileged guest at this meeting, and I hope that I won't be considered as butting in too much if I go into a little discussion of this paper. The first point to be noted in the data given in this paper is on page 4, item 1, "Heat lost in stack." Mr. Miller and Mr. Beardsley have already shown that the entire paragraph is in error, having been figured on entirely wrong basis. His net result shows 69,178 B.T.U.'s escaping as sensible heat in the blast products. Mr. John M. Rusby has figured this very carefully and shows that the loss, with stack temperature of 1,450°, is approximately 73,000 B.T.U.'s, so that, with the conditions under which Mr. Bird was figuring, namely, an outlet temperature of 1,208°, the reduction would be 16.7 per cent. of this figure, or 60,800 B.T.U.'s. Under item 2, the "Heat lost in decomposing steam and the heat energy of CO, produced," I beg to call your attention to the fact that it is figured that the uncarburetted water gas coming form the generator is 66.7 per cent., under which conditions the oil gas would necessarily amount to 333 feet in every 1,000. In ordinary practice, in fact in universal practice with oil of this character, it is not possible to get delivered in the finished gas over 65 feet of gas per gallon, under which conditions this analysis shows that there has been formed from this oil over 82 feet of gas. On the contrary, using the amount of oil as 3.8, and multiplying it by the maximum figure of 65 feet to the pound, we find that the amount of blue gas coming from the generator, instead of being 667 feet, was 753 feet. I think a little closer work on the part of Mr. Bird on this will disclose that this is true. Under which conditions the amount of heat rendered latent in the combustion becomes 203,573 B.T.U.'s, instead of 189,000, as brought out by Mr. Bird. Also, there is the excess steam, which has not been calculated, amounting to about ½ a pound of carbon per 1,000. I also call your attention to the fact Mr. Bird has assumed that all the B.T.U.'s in the coal are available efficiently. From this analysis the amount of heat to be secured from the fixed carbon alone amounts to but 11,832 B.T.U.'s. It is common knowledge that the volatile combustible in anthracite coal is largely lost during the blow and is not available in any way in the present set. Allowing that ½ of it is available there would still be a difference of 600 B.T.U.'s per

pound in the total heat. To state my position, I believe that, on a 22.83-candle power gas, securing 6 candle power per gallon, the theoetical amount of coal containing 81.46 per cent. of fixed carbon will be not less than 27.2 pounds per 1,000. This will be made up as follows—I don't know whether to read this table, unless you want to follow it against Mr. Bird's analysis: The latent heat of combustion energy delivered in blue gas is 203,873. The sensible heat of escaping illuminating gas at the superheater stack at 1,300° (and I have made this calculation at 1,300°, because nearly all the sets are running at 1,300°, and not at 1,100° or 1,200°) is 34,092. The latent heat of vaporization and gasification of the oil is 9,576. This figure has been determined quite accurately in American petroleum by Regnault, and shown to be, brought down into everyday figures on water gas machine, about 300 B.T.U.'s per pound of oil, under which conditions Mr. Bird's figures are slightly high rather than low. He also assumes that it is possible to operate a water gas machine with absolutely no CO issuing from the stack. It is manifestly impossible to do so, inasmuch as it necessitates a complete complement of secondary air for every additional percentage of carbonic oxide coming from the generator during the blow; in other words, we know that the amount of CO issuing from a fire from minute-to-minute during the course of single blows varies as much as 50 per cent. in quantity. It would, therefore, be necessary for the gas maker, while endeavoring to maintain a constant heat on a pyrometer, to so manipulate the secondary air as to accomplish this result. It is to be remembered also that the machine is cleaned but once in 24 hours, for which reason the fire conditions are different. The fire conditions are also different on account of the varying depth of fire between coalings. It seems, therefore, reasonable to believe that it is impossible to operate a water gas machine with the average CO content of the stack gas if less than 2 per cent. oilwas run on the fires on the down-run of the machine, as Mr. Bird has already stated. He also showed that this amounted to but ⅛ of a pound. I am confident that, were no oil to be run on the down-runs for a period of 6 months, the generator fuel during this period would not be lower than 28 pounds.

Mr. Miller—I have not had opportunity to study this paper, but still think the heat lost in the stack is as I said, and I would like to know what Mr. Bird thinks of it. I think it is a mistake that should be pointed out. If not, we can strike this from the discussion.

Mr. Bird—I think I will wait until the end of the discussion.

Capt. McKay—I think it very generous of Mr. Bird to bring forward here, before the assembled battalions of New England, Philadelphia and the rest of the country, a paper so replete with data, and to subject it to our rapid, slide rule, merciless, critical comment. And I think he ought to be very proud to have brought forth a discussion that will probably set the making of water gas on a new basis. May I ask one question in relation to the paper? I tried to find out how much steam was decomposed and how much was excess. As the apparatus is fitted with a steam meter, probably Mr. Bird can tell how many pounds of steam are introduced into the generator.

Mr. Bird—The average amount of steam introduced in the generator was about 50 pounds per minute.

Dr. Beardsley—I hold Mr. Ramsburg is mistaken in thinking that Mr. Bird's figures for heat lost at the stack are on the basis of pounds of fuel per 1,000. His figures are intended to show the theoretical heat loss from each pound of carbon actually burned. Consequently, I think the criticism of Mr. Miller and myself is correct—that the results should have been figured only on the fuel used for the blow.

The President—We expect lots more on this paper. Don't be bashful. Now is the time to thresh it out. Mr. Nute, we would like to hear just a word from you.

Mr. Nute—I would like to bring out one or two other points. Mr. Bird has already stated, or it has been brought out, that the make per hour or the make per set has been materially increased. This has been increased by just about 20 per cent. That means a reduction in manufacturing labor cost of from ¼ to ½ cent per 1,000—quite an item of itself—without regard to the saving in fuel. Of course, the increase in make is a material item in more ways than one. Our make in years past has been rather below the usual estimated make in a machine of this kind. We seemed to get better results by running the machine rather under its capacity than over. We are now running over its capacity with the results I have already mentioned, and we are very much gratified. Another saving, which is also a large one, is the fact that the total steam per 1,000, for all purposes about the works, has decreased from about 130 to about 105 pounds. That, however, is not all due to this new method of running the generators, but is due probably in part to other economies. But that is also like the saving in labor, a very material item. So that all the savings combined are decidedly important.

The President—Gentlemen, as the time to adjourn approaches it doesn't seem to me that justice has yet been done to the paper. I suggest that we resume the discussion and the answers by Mr. Bird immediately after lunch. I trust we shall all be here promptly at 2:30. Perhaps we can get together and draw out some new points. It is a very interesting subject.

A recess to 2:30 P.M. was ordered.

(To be Continued.)

THE Reznor system of heating water by gas is finding great favor in Massachusetts.

[CONTINUED FROM PAGE 211.]

PROCEEDINGS, SIXTH ANNUAL MEETING, AMERICAN GAS INSTITUTE.

HELD IN ST. LOUIS, MO., OCTOBER 18 TO 20, 1911.

SECOND DAY, THURSDAY, OCT. 19, 1912.—SECTION B.

The Chairman—We will now have Mr. Whittaker's paper on

TAR AND TAR PRODUCTS.

Tar as a by-product has been accorded but little attention at the hands of the American Gas Institute, and of its predecessor, the American Gas Light Association. From the first meeting of the old Association (1873) down to the present meeting of the Institute, as far as I have been able to find by looking over the Proceedings, there have been only 2 papers presented that in any way treated of the possibilities of tar as a source of revenue. One was on the "Manipulation of Water Gas Tar," by Mr. David Douglas, in 1891; the other by Messrs. Little and Skinner, in 1909, on "Tar as Applied to the Surface Treatment of Roads." There have been, of course, a number of papers on the recovery of tar, and on its uses as fuel and in generators, but no papers, with the exceptions noted, that took cognizance of its commercial values and the processes that make it valuable.

The object of this paper is to submit to the members of the American Gas Institute, a report of the business in tar and tar products carried on by the Atlanta Gas Light Company for the last 2 years. The results obtained have been considered, by a number of our friends, sufficiently noteworthy to bring before you, gentlemen. We have, however, no intention of exploiting our achievements as such, but rather of carrying out the idea expressed in our constitution of "a friendly interchange of information and ideas" that might lead some of you to view tar in a new light.

Tar has been the necessary accompaniment in the production of illuminating gas since Murdock started his first gas works in 1798. The early promotors of the gas business were probably handicapped in their first efforts by the presence of tar, and they resented the appearance of this unwelcome offspring. Tar was a decided nuisance, but when a nuisance is worked up and has a market value then it assumes the more pretentious title of by-product.

Just as some of the early forms of gas works architecture persist in this day, so some of the early antipathies against tar, and lack of interest in it, prevail even now. To some it is a by-product, to many a nuisance; and within recent years tons of it have been allowed to flow into rivers and bays to be lost absolutely to the gas companies, and incidentally to damage the fishing and to smear yachts and other craft.

Only a few years ago a change of management in a gas company, only 30 miles from one of the largest cities in this country, brought out the fact that it had been the custom to pay a man to cart away the tar and burn it in an open field. Here certainly the value of tar was not recognized even under the spur of metropolitan surroundings. In the early days of the gas industry not much attention was paid to tar. It was used as a paint, as fuel, etc. In 1815 it was distilled to a certain extent, but in 1838 its use was broadened by the invention of the process of treating timber with the oils distilled.

Great impetus was given tar distilling in 1856 by the discovery of producing aniline colors from benzol. Apparently, however, the demand for tar was not heavy enough to keep its price much above its value as fuel, which condition did not improve with the advent of bi-product coke ovens in 1894 in this country. The increasing use of water gas tended to keep down the production of gas tar. In the meantime the tar market was getting largely in the control of several large concerns that operated big plants in different parts of the country, making pitch, roofing materials, creosote, and, later on, paving materials.

In 1908 the conditions surrounding our tar business at Atlanta were not at all unusual. Our largest sales were of crude tar to a local roofing concern that distilled tar and made pitch, etc. They bought tar from other gas works also. They complained of too much free carbon in our tar, that their stills were being injured thereby and that the resulting pitch was inferior.

We had our tar stored in an old holder tank and gave the roofing company the heavy coal tar. This tar contained 25 per cent. free carbon and, naturally, the pitch was not up to requirements. Our sales fell off and the tar business seemed at a standstill. The total sales for that year 1908 amounted to $1,425, and we gained 350,000 gallons in stock during the year, giving us a total stock on hand at

the beginning of 1909 of 568,000 gallons. A large portion of this tar was stored in the water gas, relief-holder tank.

The year 1909 was the critical one in our tar history, Our stock was increasing continuously. Our sales were small. We had, of course, tar storage capacity for several years to come in our holder-tanks, and we decided to fall back on this if necessary, rather than accept any of the offers made by the large tar interests for our entire output at what seemed to us too low a price. We felt there was a better future for our tar than a 3-year contract at a low price. These long term contracts tend to cheapen tar in one's estimation, and they certainly discourage experimenting. We proceeded to boom tar for settling the dust on street surfaces, equipped ourselves with a tank wagon and sold 39,000 gallons in this way during the early summer with satisfactory results. Later on we decided to erect a still and see what we could do with our tar ourselves. I will describe the still later on. We managed to operate it in a fairly satisfactory manner, and at once found an outlet for our product by supplying road tar-binder for country road, being built about 8 miles from the gas works under the direction of the office of Public Roads. Our tar and tar-product sales for 1909 amounted to $4,670, or over 3 times the sales for 1908. We gained in stock during the year 260,000 gallons. In 1910 our business increased and we had to put in another still. The sale of roofing pitch assumed considerable importance and we disposed of our creosote at good figures. The activities of the year are indicated by the following statement of sales:

Article.	Gallons.	Value.
Pitch	44,727	$3,116.83
Road binder	96,628	5,094.49
Crude tar	64,462	4,553.37
Creosote	116,836	9,940.14
Shingle stain	2,666	972.69
	325,319	$23,682.52

The charges against the tar account for operating, etc., were as follows:

Pay rolls	$1,831.68
Salaries and commissions	1,525.58
Advertising	1,755.78
Repairs to plant	256.47
Equipment	1,345.95
Barrels	820.34
Shingle stain colors	511.91
Fuel, etc	832.34
	$8,880.05

Our stock of tar increased only 60,000 gallons during the year. We distilled 278,000 gallons. During the first 7 months of 1911 we sold:

Article.	Gallons.	Value.
Tar	80,559	$3,520.33
Pitch	64,074	3.408.33
Dust tar	15,035	528.02
Creosote	141,836	12,669.74
Stain	2,137	727.78
Binder	14,700	896.49
		$21,750.69

In this period we used 103,000 gallons more tar than we made and distilled 135,200 gallons. Our operating expenses for this period were as follows:

Pay rolls	$1,059.75
Salaries	1,082.89
Barrels	766.74
Fuel	322.00
Advertising	103.75
Equipment	174.50
Repairs	81.76
Shingle stain colors	387.13
Expense	279.54
	$4,258.06

On analysis the July payroll shows as follows:

	Costs.	Cost per Gallon of Tar Distilled, Cents.
Operating and firing stills	$83.46	0.41
Teamsters	30.42	0.15
Repairs	14.24	0.07
Loading cars and barrels	39.87	0.20
Cleaning yard, etc	17.56	0.08
	$185.55	0.91

The average net proceed per gallon of tar sold and tar distilled during the first 7 months of 1910 was 6 cents.

Establishing a Market for Tar Products.—The results that we have shown were accomplished by a good deal of advertising and pushing sales. Having launched into the tar business we were in the open market with our competitors. Our success with road tar-binder at the very outset was most encouraging. DeKalb county, Ga., was about to build a road, using binder under the direct supervision of the Office of Public Roads. Sample stretches of the road were treated with different binders (ours among them) and ours was accepted. This stamp of approval by the Government was of great advantage to us.

Creosote oil began to accumulate and we employed a salesman, who had had considerable experience in another tar concern. He was fitted out with an attractive sample case, showing the different oils, paints, shingle stains, etc. We advertised in local daily papers, and in the "Southern Ruralist," a paper of wide circulation in the South, and received inquiries and some orders from Texas to Virginia.

We got up an illustrated pamphlet on road tar and copies of this have gone pretty much all over the country. We had a representative in an automobile on the National Highway run from Atlanta to New York, and also in the "Good Road Tour" around Georgia.

At the Appalachian Exposition (Knoxville, 1910) we contributed a carload of binder to be used in an object lesson roadway built by government engineers. We put up signs on the roads built with our material stating, "This road was built with Road Tar-Binder Furnished by the Atlanta Gas Light Company." Our tank wagons have conspicuous signs over them. Our lists of articles for sale include the following:

Crude tar, at 6 cents to 10 cents per gallon, in barrel lots, used for tar concrete, paint, damp-proofing, dipping castings, pipe-dip, roof coatings, dust settling on streets, cotton tie varnish, wood preserving, dipping shingles, coating seed to prevent being disturbed by birds, etc. Also, water gas tar is sold regularly to coal gas works to thin out the heavy tar in the hydraulic main.

Pitch we sell at $11 to $14 per ton, F. O. B., Atlanta. This pitch is used for roofing, paving, waterproofing. We can produce any degree of hardness desired, etc.

Creosote is sold for wood preserving at 15 cents per gallon, in barrel lots; for shingle stain; to disinfecting works, and to wood creosoting plants where railroad ties, etc., are treated. We have our own tank car to handle this product.

Naphthaline.—We have sold some of this, but we generally keep it in the creosote.

Paint.—We worked up an excellent paint by cutting back pitch with light oils. We are using this paint on our gas meters. It is very quick drying. For stacks and special iron work we add 25 pounds of graphite per barrel. We sell our shingle stains in 8 colors at 37 cents per gallon. We bought a large quantity of the color paste put up in cans with our own label to be shipped with the creosote and mixed as required. We sell shingle stain largely direct to the builders, the dealers in the first place declining to handle our creosote.

Road tar-binder has been referred to before. We price this at 5 cents per gallon at the gas works, or 6 cents delivered in our tank wagons. This is handled hot in the tank wagons, in some cases reaching the scene of operation hot enough to be put on the road without further heating.

The importance that refined tar is bound to take in the good roads question cannot be over-estimated. Laboratory and practical tests in various parts of the country have demonstrated that prepared tar is the binder par excellence for macadamized roads. Leave out the clay and water when building a macadamized road, apply 2 gallons of tar binder per square yard in the proper manner, and a road is produced that is smooth, hard, dustless and automobile proof. With the binder costing 5 cents per gallon at the gas works, the additional cost of the superb road in Dekalb county was only 15 cents per yard over the cost of a clay-bound macadamized road. The latter sort of road would soon require 15 cents worth of repairs per square yard.

We will never again have to burn our tar or dump it out at sea, as long as there are hundreds of thouands of miles of road in this broad land of ours that need improvement. The price that we set for binder (5 cents) is rather low. We deliver in tank wagons, 6 miles away, for 6 cents. The large oil companies charge 8 or 9 cents per gallon delivered at the same place.

Fulton county, in which Atlanta is located, is building 4 miles of road south of Atlanta towards College Park. The first 2 miles was assigned to the Indian Refining Company; the next to the Atlanta Gas Light Company. The work is nearly completed, and the results with the different binders will be clearly seen, as all the sections will

(*Continued on page* 224.)

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NOTICE TO ADVERTISERS.

New Advertisements and changes of copy therefor should be in hand Wednesday noon of week prior to date of issue.

NEW YORK, MONDAY, APRIL 1, 1912.

[Official Notice.]

Fourth Meeting of the Pennsylvania Gas Association.

Pennsylvania Gas Association,
Office of the Secretary,
West Chester, Pa., Feb. 21, 1912.

To the Members, Pennsylvania Gas Association—Gentlemen: The fourth meeting of the Pennsylvania Gas Association will be held in Williamsport, Pa,, the 10th, 11th and 12th days of April. Indications are that it will prove successful and interesting, possibly more so than any other preceding one. Let us work to that end. Any communications addressed to the Secretary, care the Chester County Gas Company, of West Chester, Pa., will receive prompt attention.

Yours truly, W. O. Lamson, Jr., Secretary.

[Official Notice.]

Fourth Meeting, Southern Gas Association.

Office of the Secretary,
Southern Gas Association,
Atlanta, Ga., Feb. 19, 1912.

Gentlemen: The Fourth Annual Meeting of the Southern Gas Association will be held in Jacksonville, Fla., April 17, 18 and 19, 1912. The following papers are promised:

"Further Notes on Public Policy," by Mr. R. C. Congdon, Atlanta, Ga.

"Better Domestic Appliances," by Mr. C. A. Case, Cleveland, O.

"Scientific Salesmanship as Applied to the Gas Industry," by Mr. Albert B. Kelley, Philadelphia, Pa.

"Gas Lighting in the South," by Mr. H. P. Dains, Philadelphia, Pa.

"A Practical Demonstration," by Mrs. S. R. Dull, Atlanta, Ga.

"Practical Experiences in the Gas Business," by Mr. Roscoe Nettles, Tampa, Fla.

"The Influence of Various Departments on Commercial Work," by Mr. Chas. D. Armstrong, New Orleans, La.

"System in Office Management," by Mr. L. N. Young, Athens, Ga.

"A Study in Retort House Practice," by Mr. S. H. DeFreese, Chattanooga, Tenn.

Hotel and railroad rates will be announced later.

E. D. Brewer, Secretary.

[Notice.]

Celebration of the Centenary of the Introduction of Gas as an Illuminant, Under the Auspices of the Am. Philos. Soc.; the Franklin Institute; the American Chemical Soc.; the American Gas Institute.

Here is the latest information respecting the celebration, to hand from Mr. William J. Serrill, Acting Secretary. All communications respecting the celebration should be addressed to him at 1401 Arch street, Philadelphia. The lectures will be delivered in the Hall of the Franklin Institute, Thursday and Friday, the 18th and 19th insts., as per the following

Programme.

THURSDAY, APRIL 18th, 1912.

8:00 P.M.

By-Products in Gas Manufacture.

By Charles E. Munroe, Ph.D., Washington, D.C.,
Professor of Chemistry and Dean of the School of Graduate Studies, The George Washington University.

FRIDAY, APRIL 19th, 1912.

10:00 A.M.

The Commercial and Financial Aspects of the Gas Industry.

By Hon. George B. Cortelyou, New York,
President of the Consolidated Gas Company.

11:00 A.M.

The Technique of Gas Manufacture.

By Alfred E. Forstall, M.E., New York,
Secretary, Trustees Gas Educational Fund of the American Gas Institute, and Past Secretary, American Gas Light Association.

2 00 P.M.

Gas as an Illuminant.

By Van Rensselaer Lansingh, B.S., New York,
President of the Illuminating Engineering Society.

3:00 P.M.

The Use of Gas for Heat and Power: The Testing of Gas.

By Edward B. Rosa, Ph D., Washington, D. C.,
Chief Physicist, National Bureau of Standards.

These lectures will constitute an interesting and valuable review of the development of the use of gas as an illuminant, and as a source of heat and power. Persons interested in the manufacture and use of gas from all parts of the country, members of the Societies named, and the general public, including ladies, are cordially invited to attend the sessions. An effort will be made to bring together as many as possible of the pioneers in the gas industry, particularly those who have been engaged in the industry for 30 years or more. All such are requested to send their names to the Acting Secretary. A temporary loan exhibition will be held in the Hall of the Franklin Institute, of articles, models, appliances, books of pictures, that have an historical interest.

BRIEFLY TOLD.

The Centenary of the Gas Lighting Industry.—The work coincident to the proposed celebration of the centenary of the gas lighting industry, precise information respecting which will be found in our meetings' publication matter for the week, is going along smoothly, and the actual affair will certainly very much exceed in interest the mark so set for it by its promoters. To show that this is not mere guesswork, we here publish certain passages in a letter to us from Secretary Serrill regarding the status of the celebration as of the 25th ult.: "* * * Regarding the Centenary celebration of the introduction of gas as an illuminant, I would say that the plans for this celebration are working out in most satisfactory and gratifying manner. The prospects are that many prominent persons will be on hand to participate in the celebration. That the five lectures to be given on the 18th and 19th of April, will include a most interesting outline of the development of the gas industry in practically all of its phases, the subject of the growth of the industry, the obstacles it has to surmount, and especially its historical beginnings, are matters of interest to everybody, especially in the light of the great advances that have been made in recent years. The local exhibition, to be held in the Hall of the Franklin Institute, promises to be of unusual interest, as a number of articles, appliances, pictures, etc., of most historic interest are being collected daily. The Gas Light and Coke Company, of London, England, is also very much interested in the celebration of its One Hundredth Anniversary, and is in hearty accord and sympathy that are being planned in this country at the present time, * * *"

The Williamsport Meeting, Pennsylvania Gas Association.—Despite the unfortunate (perhaps "perplexing" would be the better word) changes brought about in the executives of the Pennsylvania Gas Association in the twelvemonth, the "remainder" simply would not be denied. Working in harmony, and in complete knowledge of

that which each was striving for, the result is that Secretary Lamson informs us that, from recent developments, the meeting at Williamsport (the 10th, 11th and 12th inst.) promises to be at least as valuable and useful as that of any predecesor session. Having considered it carefully the Committee having the subject in hand, determined to curtail the number of set papers to be read, with the result that the paper programme only carries three, as follows:

"Special Selling Campaigns," by Mr. J. E. Filbert, of York.
"Domestic Science," by Mr. Elwood Egolf, of Royersford.
"Credits," by Mr. Hoffman, of Reading.

The Committee, however, to compensate for this pruning down of the set paper list, seems to have more than made up therefor in arranging a list of topics in advance that will be regularly discussed at the sessions. Of course, one has no fairly good reason to cavil over a plethora, and it is certainty that, if all these be given even a modicum of time for their thinking out, the time of the entire 3 days will not be in any sense idle. However, we will see what we shall see! The topics list is:

Advantages and Disadvantages of Continuous Meter Reading.
Appliances, Use and Abuse of.
Advertising Campaigns, Nat. Commercial Gas Assn.
Distribution, Shop Practice.
Fixture, Combination.
Fitters, Question of
Holder Paint.
Street Leaks During Cold Weather, Method of Handling.
Leaky Holder Pits, Repairs to.
Meter, Prepayment, Consumption and Maintenance.
Instantaneous Water Heaters, Overcoming Effects on Distribution System.
Water Bureau Maps, Use of.
Water Gas Tar.

Surely that is a formidable list; but as it is better to have than to hope, let us then hope that none will be slighted. Write to Secretary W. O. Lamson, at his address in West Chester, Pa., for anything you may be desirous of knowing regarding the meeting.

ILLUMINATION STANDARDS.—The strenuous efforts which have been made during the past few years to prove the physical efficiency of various types of glassware seem to be rapidly approaching their point of termination; but these sometimes overzealous attempts at creating something, by means of reflection, diffusion or whatnot, have left a peculiar effect upon the partly informed, and a loose terminology for those qualified to speak. Successful illumination is a physiological and a psychological phenomena which can be produced with the least expenditure of energy through the aid of physical research, and the correct application of the laws of light. The physical efficiency of a lighting installation can be measured within narrow limits of accuracy, and to this factor the foot candle seems the main, if not only, standard of illumination which has been used to any appreciable extent. We have no standards covering the general direction of the maximum flux of light from a source for particular purposes; nor have we any standards as to the intrinsic brilliancy of either the source or of the objects which act as reflectors such as ceilings, walls, books, papers, etc. The color which will prove the least fatiguing has not been identified. Neither have the density, the sharpness and the direction of shadows played a large part in the agreeableness as well as the physiological criterion in respect to the effectiveness of an installation. Without these standards the attempt is made to construe pleasant and agreeable lighting installations which do not fatigue or strain the eye in terms of physical efficiency based upon the foot candles of illumination. The returning movement of the pendulum from the realm of science to art and physiology, broadens the scope of illuminating engineering and increases the need of able practitioners who are capable of discerning the atmosphere of the artist and the requirements of the oculist and then applying the most efficient method to obtain the desired results.

CURRENT MENTION—

THE Kelsey-Brewer syndicate, whose purchase of control in the Salt Lake City (Utah) property, heretofore known as the Utah Gas and Coke Company, is mentioned elsewhere in the JOURNAL, has arranged with Mr. John C. D. Clark, formerly in charge of the Commercial Division of the Peoples Gas Light and Coke Company, of Chicago, to manage the business thereof. The best of good luck to the syndicate and its latest business associate.

A NOTE from Chief Bradley, of the Consolidated Gas Company, of New York, dated March 26th, from the Hotel Manavista, Bradentown, Fla., says, among other things:

"* * * As I leave here Saturday next (last Saturday) withhold the JOURNAL till you hear from me again (which will not be long), as I shall begin to travel north, toward old New York. Florida has not been an ideal place this winter, owing to much cool and rainy weather; but, from the newspaper accounts I think we have had the bulge on the North. Shall be glad to get home again. * * *."

WELL Chief, you will be no better pleased over again arriving in New York than shall the select party that will greet your appearance in the Pennsylvania Sheds. Pardon us, the Pennsylvania depot.

"B. V. M.," writing from New Albany, Ind., the 23d March, states that, "at a meeting of the delegates to the Republican district (New Albany, etc.), convention district were chosen. By way of preface it might be remarked that the feeling respecting the possibilities as between President Taft and ex-President Roosevelt, as being the Republican nominee for President next November, was quite intense in this section. Naturally there was quite a bit of sparring in respect of securing control of the convention, through the executive officers thereof, which rivalry at one time threatened even the semblance of harmony during the sessions. The matter, however, was happily solved thus wise. To the end that the convention might be harmonious throughout and the will of the majority prevail without any after charges of unfair dealing on either side, a suggestion was made that both Messrs. Knight and Hester withdraw from the contest for permanent Chairman and that a Chairman be selected who would be satisfactory to both factions. The name of James W. Dunbar was suggested as a man who could be depended upon to give a square deal to both sides. He was accepted without question and when the announcement was made that he had been decided upon, the vast crowd, regardless of its choice for President, gave a shout of approval."

WRITE to the Brown Hoisting Machinery Company, of Cleveland, O., for a copy of its Pamphlet "S," just to hand. And write especially if you are contemplating any construction allied to or with the handling of coal into storage bins, or the removal of coal from similar receptacles. The Company's "Brownhoist Suspended Coal Bin," so that cleverest of salesmen, "Mel." Pattison declares, gains in favor all the time. In fact, said that gentleman not long ago, "Why, the original installations of this apparatus are our best selling agents. All we require, to back up our oral statements respecting it, is that the intending purchaser will inspect an example of it that has been used 5 years or more."

BOOK REVIEWS.

Heating and Ventilation.—A working manual (256 pages, 180 illustrations), by Mr. Charles L. Hubbard, of the American School of Correspondence. Price, $1.50. The author has covered a rather broad subject, in as complete a manner as could be expected in a scant volume. Numerous systems are illustrated and their operation described, with considerable data concerning their efficiencies. The controversy over standards of ventilation is not touched upon, and the familiar tables covering the number of cubic feet of air per hour per occupant are given. An important auxiliary system of heating, namely, that concerned with the various gas appliances, are not touched upon, wherefore the work is far from being complete.

Publications.

[All Publications, Catalogues, etc., mentioned below, are kept in our office for the convenience of our patrons.]

Terry Service.—The varied applications of the turbines manufactured by the Terry Steam Turbine Company, are well illustrated in a 12-page pamphlet recently issued. Both high and ordinary gas blower sets are included in the cataloguings.

Gas Institute News.—The April number of this monthly publication of the American Gas Institute is given over principally to facts and data in connection with the Centenary Celebration to be held in Philadelphia, April 18 and 19, details of which will be found in another column.

Industrial Appliances.—National Commercial Gas Association handbook sheets, covering an automatic smoke-house and glue heaters, are being distributed by the Improved Appliance Company.

Lamps and Glassware.—Similar sheets, covering lamps, mantles and accessories, Nos. 51 to 63, inclusive, are also being sent out by the Welsbach Company.

Proceedings, National Commercial Gas Association, 1911.—The "Proceedings" of this Association for the year 1911 are included in a compact volume of 417 pages, the major portion consisting of the papers and discussions at the Denver Convention.

(*Continued from p. 221.*)

be subject to the same traffic. This order called for 34,000 gallons of our binder. We have another order, that we are now filling, requiring about 132,000 gallons of binder. This drive leads from one of Atlanta's best suburban sections to the Club House and Golf Links of the Atlanta Athletic Club, at East Lake. This drive will become a most popular automobile course, and our material will be subject to a fine test.

Production of Tar in Atlanta—In 1909 the Atlanta gas works made 700,000,000 feet of gas, of which 58 per cent. was coal gas; in 1910, 790,000,000 feet of gas, of which 48 per cent. was coal gas. The balance of the gas, of course, is carburetted water gas containing about 3.6 gallons of gas oil per 1,000 feet. We figure our tar at 12 gallons per ton of coal carbonized and 10 per cent. of the oil used in water gas. We burn the refuse pitch and heavy tar from our hydraulic main under the boilers, and charge off a certain amount of tar on account of this. Careful gauging of our holder tanks, where the tar is stored, verifies our estimate of tar made. We credit manufacturing with all tar put into stock at 2¼ cents per gallon. The total credit per 1,000 feet of mixed gas due to tar, after deducting all expenses and crediting at 2¼ cents per gallon all tar put into stock, was:

Year.	Value.	Cents per 1,000.
1909	$11,045.52	1.7 cents
1910	$19,607.10	1.8 cents
1911	$14,015.28	3.0 cents

If all the tar made had been stored at 2¼ cents per gallon, the credit per 1,000 feet would have been 1.8 cents.

Quality of Tar—The coal tar contains 10 per cent. water and 25 per cent. free carbon. The water gas tar runs very low in water. Some tests show no water at all; free carbon runs about 4 per cent. The water component is found by a laboratory distillation test. The free carbon is ascertained by the solubility of the tar in carbon bisulphide. A quick way to get a rough estimate of the free carbon in tar is to drip 2 or 3 drops on a piece of white blotting paper. If there is very little free carbon (under 5 per cent.), the blotting paper will absorb the tar—making a brown, oily spot with no deposit on the surface. 25 per cent. free carbon leaves a considerable cushion of carbon on the surface, the size of which cushion grades down as the free carbon decreases. The same number of drops of tar (say 3) should be used at one spot for each test.

Description of the Tar Stills.—Our plant, as it now stands, consists of 4 vertical stills of the German type, very similar to the one described in "Lunge's" book on tar. Our stills have convex bottoms instead of concave, and two of them have domes. They are all of the same size—7 feet diameter by 8 feet deep; ¼ inch steel shell and ⅜-inch heads. They handle a charge of 1,800 gallons each. The stills are entirely incased in brickwork. A firebrick arch spans the firebox and protects the bottom of the still from the direct heat of the fire. The products of combustion are conveyed in flues, up and around next to the shell of the still, finally escaping into the stack at a point below the tar level in the still. We have not damaged the metal of the stills in the smallest degree by the heat of the fire, and the caking of carbon on the bottom of the stills has not been troublesome. Each still has a Bristol recording thermometer, and we are governed by this entirely in our operations. The first 2 stills erected have 6-inch draw-off pipes, connected at the center of the bottom with a 6-inch elbow. The 6-inch pipe is jacketed with firebrick. The cock is just outside of the brickwork. This 6-inch pipe would clog occasionally. On the next 2 stills we, therefore, did away with the 6-inch pipe, and substituted a trough-like duct, rivetted to the bottom of the still, terminating at the edge of the still with a 6-inch flange. A rod can be run from the outside direct into the bottom of the still. This facilitates cleaning out any deposits. The vapor lines run each to a separate coil in 2 condenser tanks. The coils consist of 150 feet of 2-inch pipe. Each coil is provided with a by-pass for use in case of back pressure in the coil. A 3-inch safety valve is also provided at the top of each still, and the discharge from this is piped off to a tank at a safe distance. The condenser tanks are 6 by 5 feet. The receiver for the condensed oils consists of a rectangular tank, 5 feet by 4 feet by 16 feet, divided into 4 compartments. The light or heavy oil is directed into any of the compartments as desired, and the different oils are piped off to the storage tanks. Back of the stills we have a rectangular tank, 5 feet by 7 feet by 30 feet, divided into 3 compartments, and into this the hot pitch from the stills is run. This tank serves as a temporary receptacle for the pitch which is allowed to remain there until cooled sufficiently for barreling. We have a furnace under each compartment for reheating the pitch should it be desirable to store it in this tank. The bottom of this tank is protected by firebrick arches on the fire boxes. The plain still, 7 feet by 8 feet, by ¼-inch shell, ¼-inch head, dome and flanges, cost us $425 each. Our whole plant of 4 stills, 1 preheating tank, 8 by 8; 2 condenser tanks, 5 by 5; 2 storage tanks; mason work; all piping and erecting expenses, cost $4,025, or about $1,000 per still.

Operation of Stills.—We charge the still with a combination of tars which will keep the free carbon in the pitch within the limits of the specifications. The depth of tar is gauged by test-cocks. The firing must be carried on moderately until the temperature, taken at the top of the still, has reached 280° F. There is a danger of boiling over even after the 212° mark is passed. The water and lighter oils come over until 420° is reached. Then the heavier oils begin to flow. The condenser water must be kept warm to prevent naphthaline from stopping up the oils. We run the water from 120° to 180°. We possibly lose some of the naphthas by not carrying a lower condenser temperature, but as we are not prepared to handle the naphthas separately we consider it of more importance to guard against naphthaline deposits. A steam pipe is connected to the vapor pipe at the inlet to the condenser. Steam is used to remove any deposit of naphthaline that might occur. A cock is placed on the main vapor line to prevent steam from entering the still; but, of course, this cock must be closed only after it is certain that the safety valve is ready to take care of the vapor. The line from the safety valve must also be kept clear of deposits, and a steam connection to it is essential especially in cold weather. A tar still must be treated with the same consideration as a steam boiler, and when it is under fire the vapor must escape easily through the proper channels, or undue pressure will be put on the still possibly with disastrous results. As the final temperature is approached, a sample may be run off for testing as to viscosity, but as it is rather hard to get a representative sample, we have gauged our time of distillation by the temperature. If we were handling a perfectly homogeneous tar, the quantity of oil collected would be a good index of when to draw the fires, but our tar varies too much to depend on this. When the temperature, determined by previous experiments, has been reached, the fire is drawn and the still allowed to cool. Jacketed as the still is with hot brick, the cooling down process is long drawn out. It generally requires from 8 to 12 hours before we find it safe to draw off the pitch. Our most disastrous experiences have occurred in connection with drawing off hot pitch. A dense vapor arises, and several times this has ignited and set the pitch in the receiving tank on fire. It is reassuring to know that a stream of water from a fire hose will put this fire out, though the water will make the pitch boil over out of the receiving tank. It was our original intention to have this receiving tank covered over tight and equipped with proper vent pipes. The ¼-inch iron cover was actually put on, but in drawing off some hot pitch a mixture of air and vapor in the tank exploded and blew the new cover off across the works. We considered it safer to deal with fires than with explosions, and we left off the cover. A 2-inch steam pipe, with nozzles every 12 inches, runs along one side of the receiving tank. The steam valve governing this is placed at a safe distance. If a fire starts the steam is turned on and literally blows the fire out. A water line is connected to the steam line, and water can be resorted to if the steam fails. This device has restored confidence among the men who were losing their nerve at the sight of lurid flames rising 20 feet amid masses of heavy black smoke in the midst of the gas works. We formerly would make a charge every 24 hours in each still, but waiting for the pitch to cool has lengthened the time to 36 hours. For pitch we run the temperature to 700° or 720°, and for road tar to 580° or 600°. We usually run the road tar direct into the tank wagons at 450° Pitch has to be cooled to 300° before it can be barrelled satisfactorily. For pitch we have to use heavy, single-headed oil barrels, the lighter barrels not proving satisfactory. We have been able to buy these barrels from 27 cents to 40 cents. Good, double headed barrels for creosote cost us from 50 cents to 65 cents. Another form of receptacle for pitch is the thin iron drum, which can occasionally be obtained secondhand at low prices. We use coke for fuel under the stills, a bushel of coke distilling 30 gallons of tar. Coke is charged up at 7 cents per bushel in the operating costs shown above.

Gentlemen, this is an age of conservation and economy; of conservation of national resources; of economy in all lines of manufacture. It is not conservation or economy to store your tar indefinitely, to sell it at 3 cents per gallon, to burn it under your boilers, or to let it run surreptitiously into the rivers.

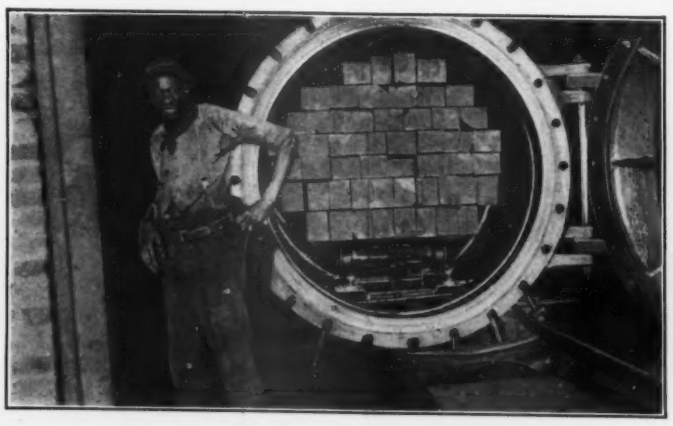


Photo 1.—End view of creosoting tank, showing railroad ties ready for removal. This tank is 6 feet in diameter, 51 feet long. 304 ties (6 inches by 8 inches by 7½ feet) make a charge, and about 1,000 gallons of creosote are absorbed. One charge is run off each 24 hours.

Photo. 2.—Tank Wagon Containing 570 Gallons of Hot Tar Binder.

Photo. 3.—Spreading and Rolling the Broken Stone.

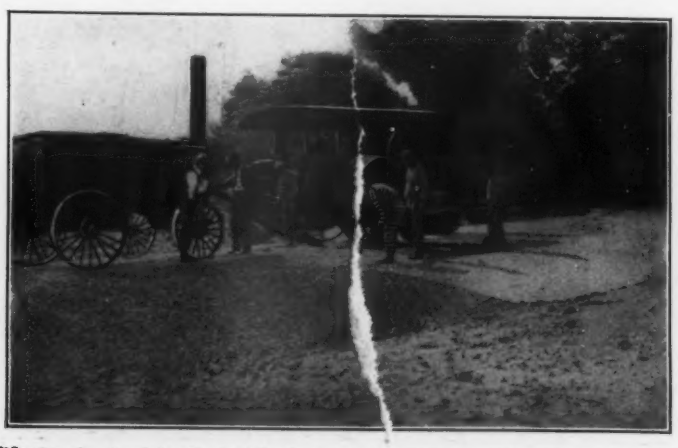


Photo. 4.—Applying the Hot Tar Binder by Means of a Hose from Heating Tank.

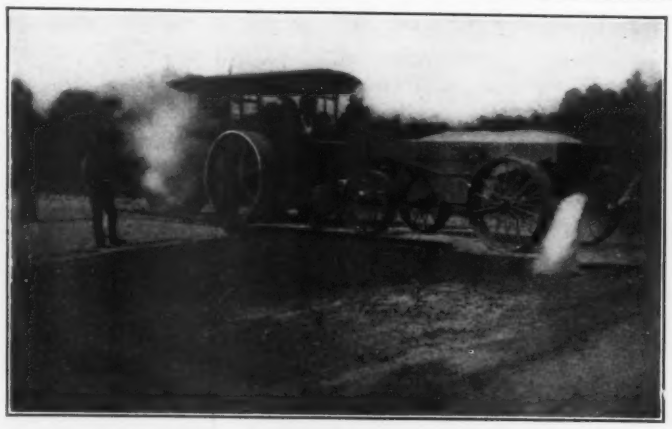


Photo. 5.—Throwing Fine Stone Chips Over Tarred Surface of Road Preparatory to Rolling.

Photo. 6.—Tar Heating Tank on Road Work.

Photo. 7.—Traction Engine and Train of Dumping Stone Wagons.

Photo. 8.—View on East Lake Drive. Paved with Atlanta Gas Light Company's Road Tar Binder.

Photo. 9. View on East Lake Drive. Paved with Atlanta Gas Light Company's Tar Binder.

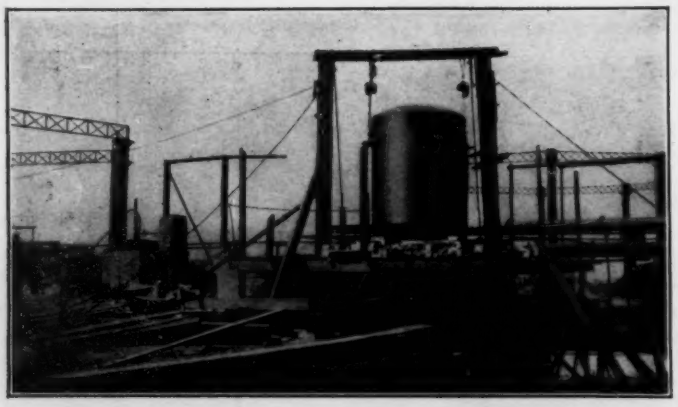


Photo. 11.—Tar Stills in Course of Erection at Atlanta Gas Works.

Photo. 12.—Some of the Tar Products of the Atlanta Gas Light Company.

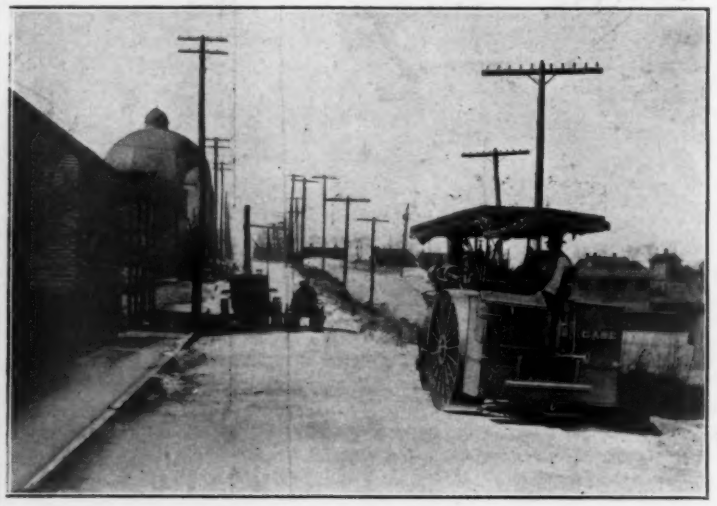


Photo. 10.—Paving West Hunter Street. Atlanta Gas Light Co's. Road Tar Binder

Photo. 13.—Tank Wagon for Sprinkling Tar on Surface of Streets for Dust Prevention.

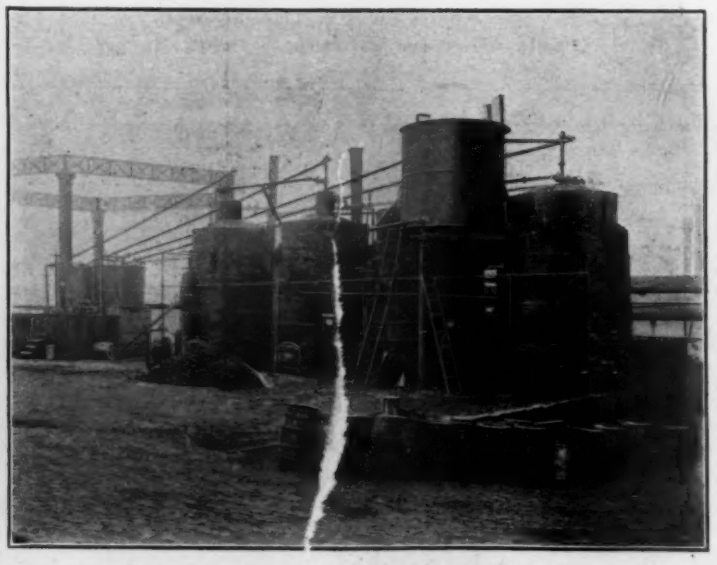


Photo. 14.—General View of Tar Stills at the Atlanta Gas Works.

Even the operator of a single bench of 6's has not played his proper part in conservation, if a single fence post or pole has been set in the ground in his neighborhood without a coating of his tar. Trees will have to be cut down somewhere to replace the rotten fence posts. Tar will delay the coming of the axemen and the trees will grow bigger. We can adopt a new motto, "Gasman, spare the tree."

The water gas operator of a junior set need not wonder what he can do with his few gallons of tar as long as the crows are eating up his neighbors freshly planted corn. We need not worry that coke oven plants are making lots of tar; we need not fear the oil companies' by-products will destroy the tar market as long as there are thousands of dusty highways, crumbling turnpikes, and water washed macadam pavement. The good road movement is on. We (these United States) are spending a million dollars a day on improving roads, but it will take all the gas tar, coke oven tar, and oil products that this country can produce for a great many years before our roads are durable and dustless. Tar is a big subject with plenty to interest the engineer, the chemist and the salesman. I feel I have but touched on the subject in a general way, but if my efforts start a general discussion of this important topic, I will feel repaid.

APPENDIX.

Atlanta Gas Light Company's Specifications for Macadam Road with Refined Tar Binder.—The road shall be brought to proper grade, allowing for thickness of stonework, and the soil or clay of filling shall be rolled with 10-ton (or more) steam roller, leaving the center crowned. All soft spots to be filled and rolled hard. A course of No. 1 crushed stone, ranging in size from 1½ inches to 2½ inches, is laid to a depth of 5 inches, and is thoroughly rolled. Stone screenings can be mixed with this stone for 4 inches of its depth. There should be no excess of fine material and the tops of the large stones should always be visible. No water or clay or other binder shall be used in this course.

The second course of crushed stone ranging in size from ½ inch to 1½ inches is laid on the foundation course, to the depth of 2½ inches and rolled to shape, but not too compactly. Road tar binder, heated to about 300° F., is applied to the surface of the stonework, preferrably by means of a hose from a tank wagon —1½ gallons of tar binder per square yard of surface shall be used. Clean, stone chips are next scattered over the tarred surface, while still hot, and immediately rolled with steam roller. The surplus screenings are swept off and a light coat of tar binder, ¼ gallon per square yard, is next applied and covered with stone screenings, as before, and rolled. The screenings should be left in place, and any uncovered tarry spots should be covered with stone screenings. The finished roadway may be used at once for light traffic, and in 24 hours for any sort of street traffic.

Tar binder should not be applied on wet stones, nor when the temperature of the air is below 45°. The tar binder shall have a specific gravity of not less than 1.20 nor greater than 1.27, at 77° F. It shall be soluble in chemically pure carbon bisulphide at air temperature to at least 80 per cent., and shall contain not over 20 per cent. pure carbon. When a sample of the tar is subjected to the float test, the float shall sink in water maintained at 122° F. in not less than 2½ minutes nor more than 3 minutes. The tar shall be free from water.

The Office of the Public Roads furnishing the following methods of examination of road tars.

Specific Gravity—This method is described in detail in the *Journal of Industrial and Engineering Chemistry* Vol, 1, No. 7, in an article entitled, "A Useful Form of Pyrometer for Determining the Specific Gravity and Semi-solid Bitumens."

Melting Point of Tar Pitches—The melted pitch is first poured into a ½-inch cubical mold and allowed to cool. The ½ inch cube of pitch is then fastened upon the lower arm of No. 12 B and S wire, bent at right angles and suspended beside a thermometer in a covered glass beaker of 250 cc. capacity, which is then placed in the waterbath. The wire should be passed through the center of the two opposite faces of the cube which is suspended 1 inch above the bottom of the beaker. The liquid in the outer vessel is then heated in such a manner that the thermometer registers an increase of 5° C. per minute. The temperature at which the cube touches the bottom of the beaker is taken as the melting-point.

Free Carbon—About 2 grams of the material is weighed into a 150 cc. Erlenmeyer flask, the tare of which has been previously ascertained, and treated with 100 cc. of carbon bisulphide. The flask is then loosely corked and shaken from time-to-time, until practically all large particles have been broken up, when it is set aside over night. At the end of this time the contents of the flask are decanted off upon a weighed Gooch crucible, fiitted with a long, fiber, amphibole filter. The residue remaining in the flask is then washed with 50 cc. carbon bisulphide, allowed to settle, and decanted as before, the insoluble matter being finally brought upon the filter and washed with 100 cc. carbon bisulphide, or until the washings are practically colorless. The filter and contents are then dried at 125° C., cooled and weighed. Should any residue remain in the flask it is also dried and weighed, and this weight added to that of the residue in the crucible. The per cent. of insoluble residue as determined as above, minus that of any ash which may be found by ignition, is reported as free carbon. Benzol may be employed as a solvent, but carbon bisulphide is usually to be preferred.

Distillation.—For this test a tubulated glass retort of 750 cc. capacity is employed. From the specific gravity of the tar, taken at 25° C., the weight of 250 cc. is calculated which amount is poured into the tarred retort. A cork stopper carrying a thermometer is then inserted in the tubulature so that the bulb is on a level with the mouth of the retort.

The tar should be heated gradually, by means of a Bunsen burner, and the first fraction to 110° C. caught in a graduated glass cylinder. A cold, wet towel wrapped about the stem of the retort serves to condense the distillate. If the tar is a crude one containing much water, great care must be taken to prevent it from boiling over. After the first fraction is collected, however, the distillation proceeds without trouble. At this point the receiver is changed for another graduated glass cylinder, and an asbestos or tin cover placed over the retort for the purpose of obtaining a uniform temperature. The flame of the burner should be so regulated that about 2 drops of distillate per second are collected. At 170° C. the receiver is again changed and a third fraction to 270° C. collected. Distillation is then stopped and any material which may have solidified in the stem of the retort is liquefied by the application of heat and caught in the last receiver.

If the water was present in the tar it will be noticed that the first fraction separates into two layers, the lower of ammoniacal liquor or water, the upper of oil. All of the fractions are cooled to 25° C., their volume-percentage calculated, and that of the pitch and the various distillates upon a weight basis should also be determined, and note made of the approximate volume of solids which precipitate from the distillates upon cooling to 25° C.

The results obtained from this distillation are reported as follows, to ½ of 1 per cent.:

1. Water or ammoniacal . . . . . pr. ct. by vol.——pr. ct. by wt.
2. First light oils to 110° C . . . . . pr. ct. by vol.——pr. ct. by wt.
3. Second light oils 110° C. to 170° C. pr. ct. by vol.——pr. ct. by wt.
4. Heavy or dead oil 170° C. to 270° C. pr. ct. by vol.——pr. ct. by wt.
5. Pitch residue by difference . . . . . pr. ct. by vol.——pr. ct. by wt.

Total 100

Directions for Making Consistency Tests with Viscosity Float.—The apparatus consists of 2 parts, an aluminum float or saucer and a conical brass collar. The two parts (shown in the drawing) are made separately for reason of economy, so that 1 or 2 of the floats will be sufficient for an indefinite number of brass collars. In using the apparatus the brass collar is placed upon a brass plate, the surface of which has been amalgamated and filled with bitumen under examination, after it has been softened suffieiently by gentle heating to flow freely. The collar must be level full. As soon as the bitumen has cooled sufficiently to handle, it is placed in ice water at 5° C., for 15 minutes, is then attached to the float and immediately placed upon the surface of the water, which is maintained at 50° C. As the plug of bitumen in the brass becomes warm and fluid, it is gradually forced out of the collar, and as soon as the water gains entrance to the saucer the entire apparatus sinks to the bottom. The time in seconds, elapsing between placing the apparatus on the water and when it sinks, is determined by a stopwatch, and is considered the consistency of the bitumen under examination. The tar prepared in accordance with directions of Office of Public Roads would show a consistency of not less than 2½ minutes and not greater than 3 minutes.

Discussion.

The Chairman declared that Mr. Whittaker's paper was now open for discussion. He asked Capt. McKay to open it. The Captain said he sorrowed over his inability to discuss the paper from a practical operation standpoint, but he very much appreciated the frank and full information Mr. Whittaker had been willing to compile for their benefit.

Mr. Fisher asked repecting a question on page 2, regarding creosoting ties, when it was shown that 306 ties took about 1,000 gallons creosote. He would like to ask the pressure shown, also the vacuum, and as to what sort of wood constituted the ties?

Mr. Perry said his remarks would be principally on the financial side of the business. On coming to Omaha a year ago last June, the Company had been in the tar business for some years, doing a considerable retail business, advertising for customers and shipping tar out to them in barrels and in 5 and 10-gallon cans. An investigation of the accounts and a careful analysis showed they were not making money on this business. They could sell tar for 3¼ cents a gallon without any distillation, and by the time they deducted all their advertising, paid the clerical hire, allowed for bookkeeping and the supervision at the works, which bookkeeping and supervision might have been given to other more important work, they figured there was not any money in their retail trade, so they cut out all their advertising on retail tar, and took on only that which came in from previous advertising, and filled those orders. Besides this business, they had installed a still which they could use to make roadway tar and which could be also used to make creosote. As the still had been used to sell only very little tar for roadway purposes, they decided to go out and drum up that business, and as an incentive to its growth they would make a price such as to net them 3¼ cents a gallon, the same as they could sell it to the other fellow. They purchased two 700-gallon tank wagons, of the same style that the Standard Oil used so that they could spread it, and delivered tar hot from the still to Park Board and County Commissioners to bind their macadam roads. For 1911 they had sold approximately 100,000 gallons of tar for road purposes, netting thus about the same per gallon as they now obtained from the manufacturer buying this tar. They also made some creosote from water gas tar; but when one wanted to sell creosote from water gas tar it was a difficult proposition. They were up against it; but they sold some 4 carloads to a creosoting firm in the North, and they liked it very much. They also sold some to stock food companies, for making sheep dip; approximately 15,000 gallons were sold to one company and it proved satisfactory to them. Now, in that business these prices, which had been as much as they could obtain, netted them about 3¼ cents per gallon, or about the same that they could sell the tar for without going into this business. Coming to pitch, when getting 3¼ cents a gallon for tar and with pitch at only 60 cents per 100 pounds, there was nothing in the pitch business unless one could get a good price for solvent napthas from the dead oils. This meant another still to get them out. They had, however, sold to one firm some dead oil obtained between certain temperatures from pitch for shingle stains. They tried to sell our creosote for shingle stains, but it was a little too dark. The dead oil from the pitch between certain temperatures seems to meet one manufacturer's demands and satisfies him and his customers. They didn't make pitch unless they had room for the dead oil to supply this particular man. Besides, they sold this year 150,000 gallons raw tar to a certain manufacturer for 3¼ cents per gallon. They brought their 3 principal demands for roadway, outside sales and their creosote business to the same basis, in competition with one another, and if it were not that they had the stills on hand they would make a contract if possible for the whole output of raw tar. In another part of Mr. Whittaker's paper it is stated that the first 11 months for 1911 the payroll was $1,059, and salaries were $1,082. Now the total for the expense items run up to $4,258. It is found necessary to keep one man at the works supervising the operation of the stills, keeping in touch with the park, the county and the road commissioners, to get their business and to see that the tar business was handled properly. That amounts to at least $1,000. Then there is the bookkeeping and everything else, which items should be almost double what they are; that is, if they were all in; and that would bring down the net profits considerably. He believed that anyone, before going into the tar business, unless he could not get a good price for his tar, should keep out of the distillation of it, letting the other fellow go in for it so long as he can induce the next fellow to pay him a good fair price, which price was perhaps 50 per cent. more than the value of tar for boiler fuel.

Mr. G. T. Macbeth said they sold tar from their plant for road purposes during last year amounting to not far from 100,000 gallons of straight water gas tar. This year they disposed of about 200,000 gallons. The gravity of the tar was 1.10, and it contained about 12 per cent. of oils that came over at a temperature below 475° F. They took no steps to get out the lighter oils or water except with the usual gas works' practice of separators. The tar was pumped into an overhead tank that contained an exhaust steam coil, the tar being drawn direct from the tank to the city wagons and driven to their works. They did their own spreading of this material on streets and roads. Some of the streets showed up very fine indeed, while in others the results were not as good. If the traffic in residential sections were confined to horse, buggies and automobiles, not running at an excessive rate of speed, it made a very good road, and the surface was fine, just as good in fact as a hot tar-binder road. Where the traffic was heavy and the automobiles ran at high speed, on such sections of the road it was of no use whatsoever. He said it was of no use, but he should rather have said it was not what it ought to be. They hoped in the coming year to take steps to extract some of the light oils, and treat the tar for work on roads, and also get a little more revenue out of it than they were now getting. One man said we were almost giving it away when selling it at only 2 cents a gallon.

Mr. Whittaker in reply said: The first question asked was that about the pressure used in this creosoting plant. I suppose you are all familiar with the general process. After steaming the ties thoroughly, there is a vacuum produced in the cylinder of 20 inches, and then the oil is introduced and steam put in it. They use 40 pounds pressure for what they call sap pine ties, 65 pounds for heart pine, and 165 pounds for oak. With the different grades they have a different pressure to drive in the oil. Some think there is not much advantage in distilling tar, but it makes you more independent. I would rather do it and handle the tar business ourselves than sell to the large concerns, for the general moral good of the community if for nothing else. Referring to Mr. Macbeth's failure, that is very generally true regarding surface treatment with tar. If you can possibly get refined tar and use it as a binder there is no comparison. The road properly built with refined tar, is practically as good as a bitulithic pavement. Of course a surface treatment is only a makeshift, and has to be done once, even twice a year, but it will prove of greater merit than a street not treated at all. It has been generally satisfactory for people who have purchased tar for that purpose. I think we ought to stop and study the matter before we sell our tar to those large concerns at a small price.

Mr. Fulweiler thought that, up to the last two years, they all had pretty much the idea that Mr. Whittaker just expressed, that surface treatment would not amount to very much; that they did not stand up; but he thought at the present time the idea was gaining ground that if the surface treatment were properly applied with tar binder that there was a great deal more in the surface treatment than had ever been brought out. His argument on this point was in no other way can one get so compact a body of stones on the road as by building a macadam road. There was no other method of handling material that would enable one to get so much stone in place and pack it. Taking a well built and thoroughly bonded road, which was very compact, and then introducing something into its top that would so bind the stone particles together that they would resist the shear of the passing motor, they should have an almost ideal road surface. It was quite true that the surface treatment had to be repeated, but he thought they now could put on surface treatments at less than the interest on the extra cost of the more expensive treatments; and if that could be done they were continually improving the surface of their roads, in addition to maintaining them. Maryland, for instance, used the surface treatment almost exclusively. They were now building good waterbound macadam roads with a thorough surface treatment, due to the fact that one could build water bound roads in any season and in rainy weather, but on a bituminou-bound road the contractor cannot work before 10 o'clock most of the time, and he had to quit about 4:30, unless he wanted to work overtime, and he could only work about 20 per cent. of the time owing to the necessity of working on clear, dry days. Of course, it must be understood that, to get the very best results in surface treatment, one would have to use binders especially prepared for that work. He did not believe the average water gas tar, crude, or the average coal tar, crude, would give the same result if it were a more carefully prepared tar binder. This sometimes works very well; sometimes not at all. His experience with the surface treatment had been practically the reverse of Mr. Macbeth's. He found where the surface treatment failed it was where one had a lot of horse-drawn traffic, but with the automobile traffic it has been very successful. The automobile wheels slide over it very easily, but when the horses are sharply shod in the spring or winter they scrape off the thin surface film, and then the moisture gets underneath and it begins to disintegrate.

The Chairman declared the meeting adjourned until 2 P.M.

SECOND DAY, THURSDAY, OCT. 19, 1912.—AFTERNOON SESSION.

THE BONE LECTURE ON SURFACE COMBUSTION.

Promptly at 2 P.M. the Association assembled in the Lectnre Hall, and there listened to the lecture by Prof. W. A. Bone, University of Leeds, England, on "Surface Combustion." For the text of the Lecture, see JOURNAL, December 4, page 355.

After the usual votes of thanks, the sessions were declared adjourned.

Special English Correspondence.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, March 9, 1912.

The Coal Supply.—Oxide Purification.—Horizontal vs. *Vertical Retorts.—Slot Meter Robberies in London.*

The national stoppage in the coal supply alluded to last month as a possibility, is now an accomplished fact. Since last Friday not a ton of coal has been raised, and I need not enlarge on the effect as regards railway traffic and manufacturing trade generally. Nearly a million miners are idle, not at their own choice, but at the bidding of the unions by which they are controlled. And a much larger number of workers are idle because their employers cannot get coal. On the railways, some of which find the carriage of coal to be one of the chief items in their goods traffic, a large shortening of "hands" is inevitable, apart from the general reduction in train service that has been inaugurated this week in order to economize the consumption of coal. One cannot say much as to the general effect upon trade over the next 12 months, because there is no previous experience to guide. It is the first time that gas engineers have been unable to obtain coal at any price. Never in the history

of the industry has such a condition been known, and the new experience will inaugurate serious changes in policy as regards the supplies and the stocks of staple materials. So far as everyday requirements are concerned the position has not yet become acute. Most of the gas companies have laid in a large stock sufficient to last several weeks, and they are hoping that the winter is over and that with longer days and milder weather the consumption of gas may be reduced. The bulk of their requirements being covered by contract, they have only felt the effect of extra prices in connection with additional purchases outside contracts, made for the purpose of increasing stocks. In most cases this can be recovered on the price of coke, which rises in sympathy with that of coal. As a general rule coke yards have been cleared and there is difficulty in meeting the clamorous demands of nervous persons who seem to think that if they cannot fill their cellars with coal, the next best thing is coke.

Household coal is quoted to-day at 50 to 75 per cent. above normal prices, and this naturally leads to a large increase in the demand for gas stoves and engines. A look down the columns of the complaint book reveals the occasional or stand by user, who hires a cooker or gas fire because the rent is low, and it is convenient in cases of sickness or other emergency. When the price of coal goes up there is invariably an increase in the small repairs required. The attention of new customers is directed by high prices of coal to the convenience and other advantages of gas, and they are easily induced to consider the arguments of our astute and judicious canvasser, one who takes care to promise a little less rather than a little more, than the actual performance. Gas companies are out for permanent business, and not here to-day and gone to-morrow, like the travelling cheap jack. And nothing is a greater drag on permanent business than a disappointed customer, who has been promised more than he can by any possibility receive. The proof of the pudding is not what the customer starts with, but what he continues to use. Not how much he is using to-day, but how much he will be using in 1 year's time. The opportunities afforded by the present crisis are not being overlooked. I have to-day seen a front page advertisement setting forth on one side the advances in price of coal and on the other the fact that the price of gas is not altered.

Fortunately for our special industry the blow, though heavy, has come at a time when we are well fortified. With very few exceptions there are good balances in hand, and with the help of increased prices for residuals the extra expense of stocking and trimming a month's stock in excess of normal can be met without increase in price of gas. The chief consideration is the prospect of a permanent settlement of the present dispute, on terms that will leave the continuity of supply as certain as we have hitherto supposed it to be. The whole question of methods of manufacture must be reconsidered from this point of view, and the events of the next few weeks will be epoch making so far as the manufacture of illuminating gas is concerned.

The attention of those who imagine that the last word has been spoken on the use of oxide of iron for purifying gas may with advan tage be directed to what is somewhat modestly called a discussion on purification, opened by Mr. Bridge at a recent meeting of the Metropolitan District Junior Gas Association, the introduction to which consisted of a fairly complete description of the latest and most improved methods of working, and contained many original features. And the value of the discussion has been further enhanced by an anonymous contribution to the *Journal of Gas Lighting*. A particular feature in each case is the value of systematic chemical analyses, when carried to such unusual extremes as the percentage of oxygen absorbed by each vessel or the quantity of sulphur absorbed by samples taken from various positions in any one box. Evidently there is good scope for the services of a competent and reliable chemist in the purifying house. Some of the findings of these writers are opposed to accepted practice. For example, nine engineers out of ten admit 2 per cent. or so of air at the inlet of the exhauster or at the hydraulic. We are now told that 0.3 per cent. of oxygen represents the outside quantity absorbed in the purifiers, and, further, about 0.4 per cent. is always present in the gas under normal circumstances, exclusive of any addition of air. When discussing questions of purification it must be remembered that the work required to be done, as indicated by the percentage of sulphureted hydrogen contained in the gas at the inlet of the first box, must necessarily vary according to several conditions. First, there is the quantity of volatile sulphur given off during the act of distillation, which not only varies according to the quality of the coal, but with the conditions of carbonization, the weight and suction of the charge, the mixing, or otherwise, of lime with the coal, and other circumstances. The apparatus used in condensing, the application of liquor and of clean water, all have their effect. And it might be remarked that the removal of sulphureted hydrogen in the washer or scrubber is an incidental matter. The proper function at this stage is the removal of ammonia and carbonic acid, and effective dealing with these compounds is of more importance than the absorption of sulphureted hydrogen. The wet purification affords the valuable assistance of reducing the proportion of the last named gas at the purifier inlet, valuable because, as every gas engineer knows, it is more than likely as easy to deal with 0.4 per cent. than with 0.8. The principal points made by the author are downward travel, the gas being admitted at the top instead of at the bottom of the vessel, the upright or hurdle system of grids, the reversing process, and the use of the disintegrator to break up the used oxide to the consistence of coarse sand. One is reminded, by the first item, of the story of the man who wound up his clock daily for 20 years, and then found it was an 8-day escapement. It has taken longer than that to find out that the more effective way is a down and not an up-gas travel.

Dr. W. B. Davidson, of Birmingham, has been publishing some of the conclusions he has arrived at after some careful experiments with horizontal through works, D section, 21 by 15 inches and 20 feet long, regenerator settings, 6 retorts each bed, and with Dessau vertical retorts, elliptical section, 22 by 17 inches at the bottom, and tapering inwards to 14 by 10 inches at the top, and the length or height was 13 feet. Each horizontal retort carbonized 26 cwt. of coal per 24 hours, and each vertical about 16 cwt. Dr. Davidson does not agree with some lately published views as to the superiority of vertical retorts, but says that, in respect to production of gas, a candle power basis, or a calorific value basis, the horizontal form takes the lead. He excludes admission of steam to the retort as not being pure distillation. He gives an interesting comparison between gas obtained from horizontals and verticals at level gauge, and also from horizontals under strong exhaust. As compared with the horizontal the vertical retort gives a poorer gas, containing 10 per cent. more carbonic acid, 20 per cent. less heavy illuminating hydrocarbons, 6 per cent. more carbonic oxide, 10 per cent. less methane and 6 per cent. more free hydrogen. He suggests that a cursory examination shows that the gas undergoes more drastic degradation in the vertical retort, but that it also suffers both in respect to quality and quantity, by the escape uncracked of a larger proportion of tar oil vapors, as shown by the larger yield of tar. Dr. Davidson's views were expressed in a paper submitted to the Midland Association of Gas Managers, and the members were so far impressed with their importance that they decided to have a special meeting in April for the purpose of adequately discussing the paper. Such a discussion is opportune at a time when there is special reason for working coal to the best possible advantage, so as to obtain the largest possible yield. And there have been so many divergent opinions expressed that it is to be hoped that a very full and completed discussion will result. At present those who are not specially interested in one form of retort or the other are doubtful how much to believe. Some years ago I was engaged to make working tests of a vertical retort and the results obtained were equal to those on record to-day. But at that time no one thought of a make of more than 11,000 cubic feet per ton of coal from horizontal retorts. If, as Prof. Davidson now suggests, it is possible to get 14,000 feet from horizontals, it is difficult to see where the advantage of inclined or vertical retorts comes in.

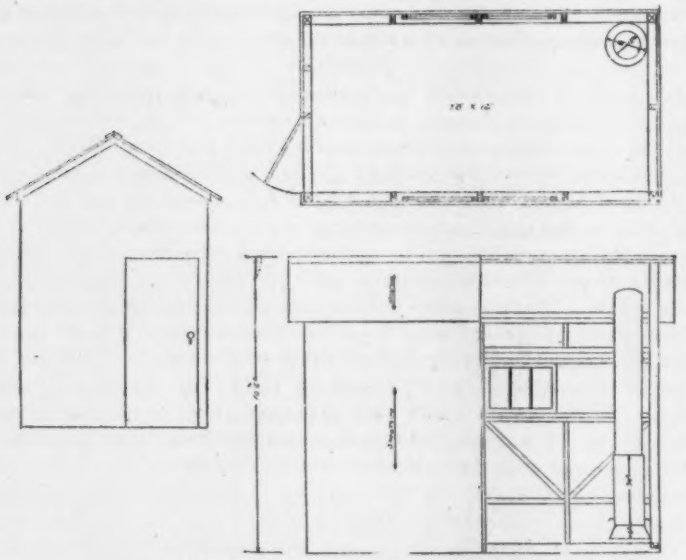
The slot meter has been honored by notice in the House of Commons. A few days ago, Mr. Joynson Hicks asked for particulars as to the number of slot meters robbed in the Metropolitan Police area during the year 1911, and the number of prosecutions, distinguishing those of children under 16 years of age. In reply, the Home Secretary, Mr. McKenna, stated that 13,261 cases had been reported to the police during 1911, and that 406 arrests were made, 86 of the arrests being under 16 years of age. The robberies took place inside houses or tenements where the police had no right of access, and in circumstances that rendered detection exceedingly difficult. This reply seems to suggest that meter robbing is a very safe line to follow, seeing that 97 per cent. of the delinquents escape the consequences. It also suggests whether the meters might not with advantage be placed outside buildings in places under the supervision of the police. Of the 406 arrests made, 20 per cent. were children under 16 years of age, and as these youthful criminals would not be so capable of avoiding detection as the experienced offenders of a mature age, it would appear that the bulk of the thefts are effected by experienced men, and that there is nothing in the idea that the convenient slot is a demoralizing agent, offering an easy descent into the desirous ways

of dishonesty. One would like to know, further, whether any particular districts are responsible for swelling the average, and also how this number figures out as a percentage on the total number of meters, and as compared with other large towns. The number of slot meters in the Metropolitan area would not be far short of a million, so the percentage of robberies would be about 1½. In smaller towns, nothing approaching this proportion obtains.

Management & Commercial Methods.

GROUND-THAWING METHOD.—In the current issue of "Gas Institute News," Mr. "Frank" Hellen, the clever gentleman in charge of the complex gas distribution system of the Rochester (N. Y.) Railway and Light Company, describes a means of manufacturing summer conditions in winter for a limited area, which problem worried the go ahead Mr. Hellen for quite a spell. In fact, the wonder is, considering the very wintry conditions which have confronted him for the past 4 months, that he managed to work it out at all. He writes:

The need arises from the frequency with which breaks occur in gas mains as a result of upheavals when the ground freezes to a considerable depth. To locate and repair these breaks require excavating through ground almost as unyielding as adamant. To overcome this, by applying heat to the surface, a structure, 12 feet long, 6 feet wide and 10 feet high, mounted on wheels, was built in which were



Portable "Hot-House" for Thawing Ground.

placed several coils of steam pipe, arranged around the sides of the interior. When a break occurs the portable "hot-house" is rushed to the break, over which it is squarely located, the heat turned on and the ground thawed preparatory to excavating. The furnishing of the heat in the shelter itself was the essence of the problem, for fire was as dangerous there as it would be in a powder mill. To overcome this part of the problem steam was taken from a boiler (also portable) and stationed at a safe distance. A device was also introduced to force the hot air, as it rose to the ceiling, down to the exact spot where the digging was to be done, which is effectively performed by a blower forcing the heated air through a 10-inch pipe. The "house" is built of several thicknesses of non-conducting material, protecting from the cold without and preventing radiation from within, the interior being also illumina ted by electricity. It is claimed the device saves hours of time when locating, excavating and repairing leaks.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,020,556. Gas Lamp. F. J. & H. H. Humphrey, Kalamazoo, Mich., assignors te General Gas Light Company, same place.
1,020,651. Gas Generator. E. Lorin, Doulaincourt, France.
1,020,782. Gas Filter. W. J. Tinker, Pierce City, Mo.
1,020,807. Safety Gas Cock. B. Devlin, Jersey City, N. J.
1,020,837. Gas Meter. A. H. Morgan, Cambridge, Mass.

Items of Interest
FROM VARIOUS LOCALITIES.

THOSE who are interested in the newest things, especially in new good things, should write to the George M. Clark & Company Division of the American Stove Company, for copies of the latest "budget" respecting the justly celebrated Clark Jewel gas stoves. The short cabinet, No. C 576, is certainly a beauty. Address them at 1493 Broadway, New York; 901 Indiana street, San Francisco; or 179 N. Michigan street, Chicago.

To the courtesy of a gentleman well versed in its affairs we have the following information respecting the named Company: "The Waxahachie Gas Company, of Waxahachie, Tex., has been incorpo rated under the laws of the State of Texas, with an authorized capital stock of $150,000, for the purpose of building a gas plant in the place named. This Company was formed by Messrs. H. M. Wallace, of Detroit, Mich., and associates. These enterprising gentlemen have just completed an up to-date water gas plant in Temple, Tex., where gas was first turned on the 29th of last February. The officers of the Waxahachie Gas Company are: President, Henry M. Wallace; Vice-President, Raymond G. St. John; Treasurer and Secretary, Wm. T. Utley. The Company is the owner of a 30-year franchise, granted last Fall, and under its terms a maximum rate of $1.50 per 1,000 cubic feet may be charged. Contracts for the construction of the plant (complete) have been awarded to the United Gas Improve ment Company, and to the Kerr Murray Manufacturing Company, of Fort Wayne, Ind. It is proposed to install a 4-foot water gas set, a relief holder, and a storage holder up to retaining 77,000 cubic feet. Mr. Herbert L. St. John, formerly with that sterling con cern, H. M. Byllesby & Co., of Chicago, will be the engineer in charge of construction; and it is certain that the plant will be in practical operation before September 1st. Waxahachie, the capital of Ellis County, Tex., is located at a point 30 miles south of Dallas, on the Houston and Texas Central and the Missouri, Kansas and Texas Railways. Its industries include the selling of cotton, the working up of cotton seed oil and an important lumber trade. The brokerage and banking interests are cutting quite a figure in its daily work, and, altogether, its present is good and its future for betterment is assured. It has a population of 7,000 or more, and the Wallace folks made no mistake in selecting it as a center in which gas could be profitably supplied."

THE failure of a dependable supply of natural gas (this time, mind you, right in Kansas) has obliged the proprietors of the Emporia (Kas.) Electric Light and Gas Company to consider the reconstruction of its artificial gas plant. The engineering details—large and small—involved have been wisely consigned to the care and custody of Mr. Henry I. Lea, whose gas engineering consulting offices are in the Peoples Gas Building, Chicago. The preparation of plans and specifications, the placing of contracts, the supervising of construction and the putting of the com pleted plant in operation will be done under the direction of Mr. Lea. It is thought he will be ready to receive bids for the different sections of the work within a fortnight.

"B.," WRITING from Boston, Mass., under date of the 22d March, says: "I no:ice you have been printing something about how useful the gas men found their quasi-friend, the electric current, this winter, the frost penetration records for which 'gone-away season' just 'frazzled' those of any predecesor ones. If you care to print it, here is another instance of the diffusible and 'pokerino glow' light currents working in harmony. Up Vermont way the temperature for days at a time last January never saw 20° above zero; no matter how often the mercury managed to record 20° below in the like period. In Rutland, Vt., there dwelt a man named Lawson, who comes pretty close to being the whole thing in the management of the gas division of the business of the Rutland Railway, Light and Power Company. Of course, many breaks were reported, but one morning an especially bad one was encountered. The earth was frozen to a depth of 6 feet, and digging was soon abandoned. Mr. Lawson impressed a truck into service and mounted thereon an electric transformer. The outfit was speedily hauled to the trouble point. The transformer reduced the 2,300 volts line alternating current to 80 volts. It was speedily found that an amperage of 14 in connection with the 80 current was sufficient to clear out the obstruction—solid in for 10 feet in a 4 inch main—in 1½ hours. The connection of transformer to pipe was made each side of the choked main, and direct to the main.

Of course, the passing of the electric current through the pipe raises its temperature, and the temperature raise does the rest."

"REGULATIONS of a stringent character to govern the installation of gas ranges and gas heaters in the District of Columbia are now before the United States House of Representatives, as per the bill introduced some time ago by Representative Austin, of Tennessee. Under the provisions of the bill the Commissioner of the District would be empowered to describe the kind of appliances that may be used, the manner of their installation and the method of maintaining such. Failure of an owner or tenant to conform with the rules in the prescribed ways would cause the constant removal of gas appliances already installed, in case the fixtures failed to meet the requirements set forth in the regulations, which would be framed by Commissioners. Furthermore, the bill makes it unlawful for a merchant to sell, or to offer for sale, any apparatus or appliance not approved by the Commissioners. Violations are to be punished by a fine, of not less than $100 nor more than $500 for each offense, or by imprisonment for not less than 6 months or more than 1 year, or by both fine and imprisonment. The District Police Court would have jurisdiction in trials of cases arising from the operations of the proposed aw.—E."

"WITH much regret we are called upon to chronicle the passing away of Mr. George G. Atkinson, Superintendent of the Goshen (Ind.) Gas Company, the morning of March 15th. His illness was a very brief one. Mr. Atkinson's term of service with gas companies in the Middle West was lengthy and successful. Ever diligent in the discharge of his duties, in a quiet and kindly way he was always ready to extend a helping hand to those who needed assistance. He will be greatly missed by those with whom he was associated in business, and by a large circle of friends and acquaintances." For this mention we are indebted to the attention of Mr. D. F. Burritt, of Detroit.

THE Stern syndicate, which has been operating the gas plant in Amarillo, Tex., seems to be making its way along prosperous lines. For instance, here is a graphic statement respecting the output in cubic feet for the respective months of January, 1910-11-12:

1910.	1911.	1912.
1,486,900 cubic feet.	1,692,100 cubic feet.	2,182,600 cubic feet.

The Company now has a total storage capacity of 120,000 cubic feet; mileage of mains, 14; rate (gross), $1.50; net, $1.35. About 45 per cent. of business could still be obtained along existing main lines, and the Stern folks are after it actively. It is calculated that, with a relatively small increase in the main system, about 600 additional consumers could be secured; and these the Messrs. Stern propose to get this summer.

THE bill proposed in the Boston legislature, to do away with rental charges for gas meters, has been rejected. Mr. Griffin, of Boston, moved to substitute for an adverse report on a similar bill prohibiting rental charges for the use of electric meters was also rejected.

THE first dividend on the shares of the Pacific Coast Gas and Electric Company was declared March 15th. The rate is 1¼ per cent., and the time payable is the 15th inst. It is a sure thing that at least 1¼ per cent. will hereafter be paid quarterly on the Company's capital stock.

THE Gas Machinery Company, of Cleveland, O., has been awarded contracts for the furnishing of silica retorts and settings to be installed in the generating houses of these gas plants: Marinette and Portage, Wis.; and Menominee, Mich.

MR. J. G. LIGHT, who has acted as Manager for a number of years of the Ottawa (Ills.) Company, has been appointed Manager of the Flint, Mich., plant.

MR. W. W. JOHNSON, formerly Superintendent of the Niles (Mich.) Gas Light Company, has been appointed Superintendent of the Goshen (Ind.) Gas Company.

MR. VICTOR F. DEWEY, Manager of the Grand Rapids (Mich.) Gas Company for some time back, has been appointed Manager of the Utah Gas and Coke Company, of Salt Lake City, succeeding Mr. J. Charles Ross. This Utah property was recently taken over by the Kelsey-Brewer & Co. syndicate, of Grand Rapids, Mich.

IT might be well to here note that the executive management complete, of the Salt Lake reorganized concern is as follows: Directors, Chas. B. Kelsey, Frank B. Stephen, C. A. Bolt, George A. Snow, Blair Garrett and Victor Dewey; President, Chas. B. Kelsey; Vice-President, George A. Snow; Secretary and Treasurer, Joseph H. Brewer.

ON the 10th inst., application will be made to the Governor of Pennsylvania, by the projectors of the Atglen Gas Company, for the right to manufacture and supply gas in Atglen, Chester County, Pa. Its putative sponsors are Messrs. F. R. Hausell, G. H. B. Martin and S. C. Seymour.

THE Citizens Gas Company, of Indianapolis, Ind., has agreed with the Stacey Manufacturing Company, of Cincinnati, under which the latter will construct a gasholder up to retaining 5 millions cubic feet. The holder is to be completed by December 1st, 1912.

THE people who organized the Watertown (Conn.) Gas Company and secured the other necessary legal consent prior to actual construction work, have turned these over to the owners of the Waterbury (Conn.) Gas Company, who will this spring pipe Watertown and the adjoining settlement of Oakville for a gas supply.

MR. E. D. GRAY, son of Mr. A. D. Gray, of Chariton, Ia., is moving in respect of establishing a gas plant in the place named. It looks a good proposition.

THE shareholders of the Middletown (Conn.) Gas Light Company have assented formally to the proposition of President Burrows and his associates that the capital stock be increased in the sum of $50,000. The money thus obtained will be devoted to plant betterments, prominent in the detail of which is a storage holder; also, a coal storage shed.

A FEATURE of the March bi-monthly Woonsocket (R. I.) Gas Company's Gas and Electric Employees' Club, was a lecture by Mr. Paul Zeheran, of the Stone & Webster Engineering Corporation, detailing the development of the Mississippi River Power Company, at Keokuk, Ia., which development is being brought through under the detail of the Stone & Webster people. The length of the dam (of concrete construction) is 4,278 feet, and when completed it will consist of 119 arches, or spans, 30 feet in length, on piers 6 feet thick, forming a bridge with a 39-foot roadway. The purpose of the dam is to impound the waters of the Mississipi river, as it will do at a point where the average depth is 4 feet, causing an extending of the river navigation possibly 100 miles further north than now. The lecture was profusely illustrated by means of lantern slides, and the general effect was sufficient to closely enlist the attention of his auditors for 2 hours or more. The guests of the Club included the City Engineer, Mr. F. H. Mills, and City Clerk, Mr. W. O. Park.

WORK has been commenced on the new electrical equipment for the works of the Chatham (Canada) Gas Company. Secretary Coate says that if the equipment works out to the economies estimated a sensible cut will be made in the electric rates now prevailing in Chatham.

MR. HOMER P. WHITSTONE, since 1903 connected with the distribution department of the electric division of the trading of the Youngstown (O.) Gas and Electric Company, has been appointed Manager of the wiring section of the Electrical Maintenance Company.

THE St. Louis County Gas Company, St. Louis, Mo., has made public the following revised schedule of gas rates: Minimum monthly use, 50 cents per month; 10,000 cubic feet or less per month, gross, $1.20, net, $1.10 per 1,000; next 15,000, net, $1; next 25,000, net, 80 cents; next 50,000 and over, 60 cents.

MR. JOSEPH L. J. BUCKLEY, a member of the office force of the Pawtucket (R. I.) Gas Company since 1900, died at his home in Pawtucket, the morning of the 16th ult. At the time of his death he was in charge of the Company's collecting bureau. He was a soloist in the choir of the Church of St. Joseph, in which edifice a requiem mass was sung over him the morning of the 20th ult. His immediate survivors are his father, his wife and a son.

AT a meeting of the shareholders of the Nashville (Tenn.) Gas Company the Directors elected were: Jos. H. Thompson, J. B. Richardson, T. E. Matthews, T. W. Wrenne, G. A. Puryear, B. F. Wilson, Chas. Shinkle, Martin Gilmore, W. D. Talbot and T. J. O'Keefe.

MR. F. W. FARRINGTON, Supt. of the appliance department of the Union Gas and Electric Company, of Cincinnati, O., was stricken with apoplexy while conversing in the office (the morning of the 18th ult.) with Mr. H. J. Hoover, Manager of the Company's Commercial Department.

The Market for Gas Securities.

Something seems likely to happen. Always prior to an important move in Consolidated (for years past such has been the case), for from 3 to 6 days in advance of the real direction of the move, thousands of shares will change hands without the varying of 2 points in quoted values. Next thing in evidence is either a slump of many points or a gain of many points in the overnight trading. Well, such a condition exists this week. Early in the trading 12,000 odd shares were sold within a net range of 1¼ points for the 48 hours. And several times within the past fortnight the daily sales in the Broad street shambles of Consolidated have been more than ordinarily heavy. All this is preliminary to the remark that between Wednesday and Friday Consolidated without much ado went to 145½. The opening this morning (Friday) was 145½ to 146.

Brooklyn Union did not respond to the springy work exhibited by its near neighbor, but investors need hardly be told that the stock is fully worth its nominal quotation, 141 to 143. Peoples, of Chicago, is on the upward way, so also are Lacledes. The general situation favors the investor.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

APRIL 1.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$78,177,000	100	145¼	146
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	103	105
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	105	106
Mutual Gas Co.	3,500,000	100	165	175
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	101	102½
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	35	50
1st Mtg. Gold Bds. 5 p. ct.	1,500,000	—	98¼	100½
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	103	105
Con. 5's, due 1945, J. & J.	1,500,000	—	95	100
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	100	102
Standard	5,000,000	100	60	70
Preferred	5,000,000	100	90	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	103	105
The Brooklyn Union	15,000,000	1,000	141	143
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106¾	107
Yonkers	299,650	500	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	⅛	¾
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	500,000	1,000	97	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	59	60
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed				
Gold Bonds	7,860,000	1,000	104	106¼
Cincinnati Gas and Electric				
Co.	29,500,000	100	87	90
Columbus (O.) Gas Co., 1st				
Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. &				
Heating Co.	1,682,750	100	90½	91
Preferred	3,026,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	13,460,084		—	—
Mortgages, 5's	3,400,000		—	—
General Mortgage 4½	10,661,000		—	—
Con. Gas Co., Baltimore				
City, 4½	2,751,000		—	—
Consolidated Gas Co. of N. J.	1,000,000	100	15	—
Con. Mtg. 5's	976,000	1,000	94	96
Bonds	75,000	—	—	100
Essex and Hudson Gas Co.	6,500,000	—	133	136
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co.,				
1st Mtg. 5's	1,350,000	1,000	100	101
Hartford	750,000	25	190	200
Hudson County Gas Co., of				
New Jersey	10,500,000	—	133	138
" Bonds, 5's	10,500,000	—	104	106
Indianapolis	2,000,000	—	—	38
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	91	95
Kansas City Gas Light Co.,				
of Missouri	5,000,000	100	—	86
Bonds, 1st 5's	3,822,000	1,000	99	102
Laclede Gas Co., St. Louis.	10,000,000	100	106¼	107
Preferred	2,500,006	100	114	120
Bonds	10,000,000	1,000	102½	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,370,000	50	143	145
Madison Gas and Electric Co.				
" 1st Mtg. 6's	400,000	1,000	106	106¾
Massachusetts Gas Companies, of Boston	25,000,000	100	93	93¼
Preferred	25,000,000	100	98¼	98½
Montreal Gas Co., Canada	2,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	97	98
Bonds, 6's	6,000,000	—	127	128
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co.,				
Chicago	25,000,000	100	107⅝	108
1st Mortgage	20,100,000	1,000	102	102½
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104¾	105¼
Pacific Gas and Electric Co.	15,500,000	—	53½	55
St. Joseph Gas Co.—				
1st Mtg. 5's	1,000,000	1,000	96	98
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	105
Extension, 6's	600,000	1,000	112¾	115
General Mortgage, 5's	3,447,000	1,000	94	96
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	101	103
Washington (D. C.) Gas Co.	1,600,000	200	425	427½
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	—	—

MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, October 16 to 18, 1912. Atlantic City, N. J. Officers: President, Ira C. Copley, Aurora, Ills. Secretary, Geo. G. Ramsdell, 29 West 39th st., N. Y. City.

Canadian Gas Association.—Annual meeting, ———— Officers: President, Arthur Hewitt, Toronto, Ont.; Secretary and Treasurer, John Keillor, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, New York City, Oct. 1912. Officers: President, R. M. Searle, Rochester, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street. New York City.

Gas Meeters.—Monthly meetings. Chairman, I. W. Peffly; Secretary, H Thurston Owens, 42 Pine street, New York City.

Guild of Gas Managers of New England.—Annual meeting, March, 1913. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, Walter G. Africa, Manchester, N. H.; Secretary, H. K. Morrison, Brockton, Mass.

Illinois Gas Association.—Annual meeting, time, March———— 1913. Chicago, Ills. Officers: President, H. O. Channon, Quincy, Ills.; Secretary-Treasurer, Horace H. Clark, Chicago, Ills.

Illuminating Engineering Society.—Annual meeting, Sept. ————1912, ———— Meetings of Sections, monthly. Pres't, V. R. Lansingh, New York City; Secretary, Preston S. Millar, 29 W. 39th street, N. Y. City. Sections: New York, Secretary, Albert J. Marshall, 16 East 40th street. New England, Secretary, H. C. Jones, 10 High street, Boston, Mass. Philadelphia, Secretary, L. B. Eichengreen, Broad and Arch streets. Chicago, Secretary, Edward Wray, 106 N. LaSalle street.

Indiana Gas Association.—Annual meeting, March, 1913, Indianapolis. Officers: President, Howard L. Olds, Indianapolis; Vice-President, Wm. Wallace, Lafayette; Secretary-Treasurer, Philmer Eves, Indianapolis.

Iowa District Gas Association.—Annual meeting, time, May, 22, 23 and 24, 1912; Lincoln, Neb. Officers: President, G. W. Clabaugh, Omaha, Neb.; Secretary and Treasurer, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, time, Oct. 17-19. Manhattan, Kas. Officers: President, B. F. Eyer, Manhattan, Kas.; Secretary and Treasurer, J. D. Nicholson, Newton, Kas.

Michigan Gas Association—Annual meeting, time, Sept. ————1912;———— Officers: President, F. W. Blowers, Kalamazoo, Mich; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April 11-13, 1912; Joplin, Mo. Officers: President, F. E. Murray, Louisiana, Mo.; Secretary and Treasurer, N. J. Cunningham, Springfield, Mo.

National Commercial Gas Association.—Annual meeting, Dec. 2-5, 1912. Atlanta, Ga. Officers: President, C. L. Holman, St. Louis, Mo.; Secretary, Louis Stotz, 29 West 39th street, New York City.

Natural Gas Association.—Annual meeting, May, 1912, Kansas City, Mo.; Officers: President, A. B. Macbeth, Independence, Kas, Secretary, T. C. Jones, Delaware, O.

New England Gas Association.—Annual meeting, February,————1913. Boston. Officers: President, D. D Barnum, Worcester, Mass.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

New Jersey State Gas Association.—Spring Meeting, April 25, Lakewood, N. J.—President, William H. Pettes, Newark, N. J.; Secretary-Treasurer, Arthur H. Osborn, Belmar, N. J.

Ohio Gas Association.—Annual meeting, February ———, 1913, Columbus, O.; President, John M. Garard, Columbus, O.; Secretary, L. B. Denning, Columbus, O.

Oklahoma Gas, Electric and Railway Association.—President, Noel R. Gascho, Alva Okla.; Secretary, H. V. Bozell, Norman, Okla.

Pacific Coast Gas Association.—Annual meeting, San Diego, Cal., September 17, 18, 19, 1912. Officers: President, W. Baurhyte, Los Angeles, Cal.; Vice-President, Henry E. Adams, Stockton, Cal.; Secretary-Treasurer, John A. Britton, 445 Sutter street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, Williamsport, Pa., April 10-12, 1912. Officers, President, W. R. Rhodes, Williamsport, Pa.; Secretary-Treasurer, W. O. Lamson, Jr., West Chester, Pa.

Society of Gas Lighting.—Annual meeting Dec., 13, 1912; monthly meetings, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 29 West 39th street, New York city

Southern Gas Association.—Annual meeting, April 17-19, 1912, Jacksonville, Fla. Officers: President, H. B. Hoyt, Jacksonville, Fla.; Secretary-Treasurer, E. D. Brewer, Atlanta, Ga.

Southwestern Electrical and Gas Association.—Annual meeting. April 25, 26, 27, 1912, San Antonio, Tex. Officers: President, J. E. Carroll, Beaumont, Tex.; Secretary, D. G. Fisher, Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May 15 and 16, 1912, Milwaukee, Wis. Officers: President, H. M. Buck, Waukesha, Wis.; Secretary-Treasurer, Henry Harmon, Milwaukee, Wis.